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Old and new Santa Fe Railway crossings of the Illinois River near Chillicothe, Illinois

High-Level Bridge Eliminates Old Swing Span

Rubber Pavement—Six Years' Experience at Chicago

Large Culvert Built of Corrugated Iron Plates

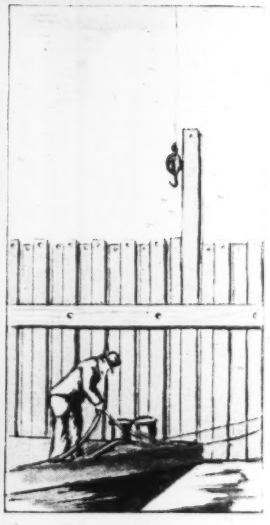
Experiments in Gunite Control at Syracuse Reservoir

Wrapping a Cement Coating on 66-in. Steel Pipe

Field Observations on Highway Practices

Reviews of Recent Engineering Literature

LACKAWANNA PILING IN GOVERNMENT WHARF ON SABINE NECHES CANAL



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F. E. Schmitt, Editor

NOVEMBER 19, 1931

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Fluid Building Credit

A MORTGAGE loan discount bank system is to be proposed to Congress, the President announces. Six months ago the National Association of Real Estate Boards urged such action, but on a broader base—to cover the entire building field instead of merely small housebuilding as the official plan contemplates. Under the present limitation, reform of the whole real-estate security tangle is not in sight, therefore. Even so, however, the plan will help all building by making credit more fluid. Whether it will also bring down the excessive cost of house mortgage loans remains to be seen; probably not, unless the rooted traditions of centuries are shattered—those traditions that place the highest burden of cost on the strongest possible loan security: the rooftree of the family. But time may prove effective; in the course of years even the sacred doctrine of 6 per cent may yield, and the bond and mortgage may be rated as favorably as its flighty and unreliable sister, the unsecured note or commercial bill. Then building credit will finally become as free as it merits.

About 1960

EVENTS of the past week provide most conclusive evidence that there is no economic justification for a ship canal across Nicaragua. Unusual flood conditions and a large slide in the Panama Canal tied up traffic through the canal for only a short time, about three days, and it is now clear beyond doubt that with the better flood control to be provided by Madden Dam and the progress made in attacking the unstable cuts no major delays need be expected from those sources. Even were this not the case, the cost of such delays can give no justification for a new canal. Nor is there justification on the score of increasing traffic. Estimates of future traffic, given in Governor Burgess' just published annual report, indicate that the capacity of the present locks will not be reached until about 1970. To meet that limit he recommends that construction of the third set of locks be begun ten years earlier. In short, the present canal is ample for all the traffic in sight for the next 40 years, and about 1960 will be time enough to think of enlarging the Panama Canal. When enlargement of the present canal to its maximum capacity has been carried out there may be justification for planning for a second canal. Just now no such justification exists.

Niagara to New York

POPULAR fancy has seized upon the projected interconnection between the Niagara-Hudson electric system and the New York Edison system as the culmination of a long-dreamed-of plan to bring power from Niagara Falls to New York. The project calls for the construction of a high-tension line from the present terminal of the Niagara-Hudson system near Albany to New York City. Actually this interconnection does not mean that Niagara power will come to New York, but rather that surplus power on the network of one great system may, when needed, be used to make up deficiencies in another great system having different generating and demand characteristics. The New York Edison system draws its power from steam stations; the Niagara-Hudson system gets its power from both steam and hydro stations and has possibilities for expanding its hydro-electric output on the upper Hudson and other streams rising in the Adirondack Mountains if a market for that power can be found. Supplying power to smooth out the load peaks of the New York system provides such a market, hence the proposed interconnection. If it were possible to earmark a unit of electric energy it might be found that such a unit does occasionally find its way from Niagara to New York, but essentially the new connection is merely the tapping of a great power reservoir of which the Niagara power generating units are only one of many sources of supply. The reason for its construction is that stand-by generating equipment is expensive, and any interconnection that reduces the amount of such equipment operates to the benefit of the communities served, giving both economy and more reliable service.

Compromise

AFTER months of negotiation an attempt to effect a financial compromise between the defaulting Merced Irrigation District in California and the bondholders has been unsuccessful. As a result, the district is legally compelled to levy a $5.60 assessment to cover its financial obligations. It is not impossible that the marginal tax limit has been exceeded and that the assessment dictated by law will result in less revenue than could have been produced by a smaller levy. The negotiations, outlined in these columns some months ago (*ENR*, Aug. 20, 1931, p. 283), would have brought distinct advantage to both parties. Briefly, they provided for allocating most of the district's power revenue to the security holders and for decreasing the interest rate over a five-year period. The plan was designed to allow the irrigation district a period to get on firmer financial ground and, on the other hand, assure the position of the security holders. The present result threatens only further complication. Economic conditions dictated a need for compromise, and the inability to effect it may result in a loss for both sides. There are other district organizations and some municipalities whose securities may be in line for readjustment and in all cases the approach to a solu-

tion must be made in a spirit of compromise to accomplish beneficial results.

Prequalification

STEADY progress has been made throughout the country in the practice of prequalifying bidders on public-works construction. The practice of barring from bidding contractors who are unfit to handle certain work by lack of experience or capacity has made continuous progress as being in the public advantage, and no valid objection to it has appeared. However, the courts have shown that they will not tolerate prequalification practice that is not fair, impartial and backed by proper legislative authority. Justice Witschief, of the New York Supreme Court, reiterated this stand in denying the city of Mount Vernon the right to use prequalification on a new school project. His decision is based on a number of concrete objections, including (1) lack of specific authority either by statute or by local ordinance; (2) failure to state in the advertisement what use would be made of the experience and financial data requested, and to provide for rejection of application for plans and specifications; (3) failure to provide for an appeal by rejected contractors. The court's opinion does not attack the principle of prequalification, but it does issue a warning which all public-works engineers and officials interested in the practice cannot ignore. The continued use of prequalification depends upon its intelligent application. Its progress should not be checked by bad practice.

A Second Great Bridge

THREE weeks after opening the Hudson River suspension span the Port of New York Authority was host at another bridge christening celebration, the opening of the Kill van Kull arch connecting Staten Island, N. Y., and Bayonne, N. J., and spanning the "kill" or estuary that joins Upper New York Bay with Newark Bay. It is unusual, if not unprecedented, for two such great structures to be completed simultaneously. While the Kill van Kull arch by no means equals the Hudson River span in fame or in importance, it nevertheless is a structure of major significance. With its span of 1,675 ft. it is the longest arch bridge in the world, and even its uncompleted contemporary, the Sydney Harbor arch, will be no longer, though heavier in capacity and weight. It makes precedent in other important respects. Its erection involved the daring and successful use of falsework bents in a manner that may find application elsewhere now that it has been proved practicable on a large scale. Its utilization of carbon manganese steel for main stress-carrying members and for 1¼-in. field rivets is significant because it adds one more alloy steel to the relatively small group available to the structural engineer. In these respects and also as a link in the highway system of the New York metropolitan area, the Bayonne bridge is destined to bulk large in bridge engineering history.

Forty-four Million Vehicles

THE Bayonne bridge is opened to traffic just four years after the Holland tunnel was put into service. In that period nearly 44,000,000 vehicles have passed through the tunnel. The record is impressive, especially for the past year, when despite the depression in industry new records for a single day's traffic and for truck movements were set up. Four years ago many people were skeptical about the possibilities of the tunnel as a traffic artery of economic value to the port district; today none can doubt its value. Even with its high initial cost per lane of traffic and the high cost of operating it the tunnel is rapidly repaying the two states for their investment. Traffic prospects for the new Bayonne bridge are not so bright, although the Port Authority hopes to stimulate traffic across it by offering combined rates through the Holland tunnel and over the bridge to Staten Island. When a bridge from Bayonne to Staten Island was first proposed it was expected that traffic for south Jersey and seashore points would cross that way to Staten Island and then cross again to the mainland either by the Goethals bridge or the Outerbridge crossing (both owned by the Port Authority) to avoid congestion around Newark and Elizabeth. But now the New Jersey state highway department is rapidly completing its superhighway with its high-level crossings of the Hackensack and Passaic rivers, bypassing all centers of congestion and free of tolls west of the Holland tunnel portal. The chance of the lucrative seashore traffic using the Staten Island route with two tolls and indifferent roads part of the way is small. The justification for the Bayonne bridge now is found in providing Staten Island with better access to the New Jersey industrial district along the Hudson River and to New York itself. Ultimately, tunnels under the Narrows will make the Bayonne bridge an essential link in a new highway route between Brooklyn and the New Jersey waterfront.

A Second Drought Year

A YEAR ago it seemed that another drought period like that of 1930 need not be expected for a long time. Nature's erratic variations have overthrown this expectation. A second dry period affects several large areas of the country, most of all the Southeast, where the shortage of water is unprecedented.

Thus far no great losses have resulted, for, prompted by the great drought of 1925, the power companies, municipalities and industrial concerns in the Southeastern states took steps to avoid recurrence of the troubles they had then. Steam plant reserves subsequently provided for their hydro plants have up to now carried the power companies through the present emergency, with hydro output a fraction of rated capacity. Additional municipal and industrial water resources that were developed also have up to date been sufficient in nearly all cases to provide needed supplies, with restrictions on use.

But in many cases the margins of reserve are very scanty. If industrial activities were normal, shortages would be keenly felt in many directions. Moreover, there is no telling when the present great depletion of groundwater is likely to be made good. In fact, it appears sure that most streams will go much lower than their present levels, which are all-time minimums. Reserve storage capacities that have been available also are now virtually depleted.

A great region is face to face with a serious situation as to water resources. For the municipal engineer it means vigilance to forestall unexpected difficulties such as arose in the way of intestinal troubles caused last year by the use of the low flows of the Ohio and its tributaries. After the emergency passes there must be a thorough check to see whether power and domestic water

resources are sufficient to meet even a drier two-year period than the present one. The well-known uncertainties of rainfall, strikingly illustrated by the 1930-31 dry period coming close after that of 1925-26, give warning that what now seems a record minimum of streamflow may in time be again passed.

Relief Through Public Works Needs National Support

WHATEVER rays of light may be appearing on the business horizon, unemployment is not decreasing, and the outlook for a winter of distress becomes daily more certain. Each day brings up anew the question whether this distress is to be relieved by providing opportunities to work and earn a living or by dispensing charity. The question is uppermost in every mind, and everyone is seeking for a way by which work can be given to idle hands.

State and city governments are bearing the whole burden of providing work, save for a few philanthropic organizations that are combining made-work relief with charity. Private business and private construction are not making visible progress toward improving employment, and in some quarters are adding to the problem by further reducing their working forces. The national government, satisfied with its road and building commitments, declines to increase its public-works operations.

But there are limits to what the cities can do. Their shrinking income compels all of them to curtail budgets, defer construction that they had planned to undertake, and discharge large numbers of municipal employees. Bond issues are rarely approved, and in the poor bond market now prevailing might be hard to sell. In every way the city is weakest of all major governments in respect to financial powers.

A sharp protest that reveals the plight of the city under this severe stress was sounded by C. A. Dykstra, city manager of Cincinnati, before the International City Managers Association, recently:

> It is entirely possible that what is passing for federal action in this unemployment crisis is making the city's job still harder. If after eighteen months' consideration and study the latest news out of Washington is that cities can best handle their own industrial problems, we have had little federal suggestion or action. What cities need just now from Washington is correlated information on employment and a national program of employment agencies and employment distribution. What they get is the cheerful news that distress is a local and municipal problem. The fact that in such times those who have nothing pour into our cities for relief and thus add to our local problems is not taken into account. . . .
>
> Together our leaders of industry, employers, social workers and the federal government meet solemnly to discuss measures of relief. They point out that American law places the burden of relief upon local government and has always done so. They agree that our present status is not due to disaster or act of God. And so the conclusion comes that our present problem must be resolved as poor relief. I cannot agree that the feeding and clothing of ablebodied men and women anxious and willing to work can permanently be functions to be dumped upon city authorities. In the present emergency that method may be the only one left to us. But . . . every city budget has been wrecked in an attempt to meet the present emergency.

No one can miss the anxious note in this statement. It adds strength to the general realization that municipal construction activities can provide but a small part of the relief needed this winter, unless national support be given them. Faced with simultaneous demands to alleviate distress and to reduce taxes, hampered by a heavy decrease in taxable values, the cities are plainly unable to care for the emergency adequately. Only with the aid of the entire nation's financial strength can they accomplish it.

Today, even more than three months ago, when we warned of the winter's emergency and called for a large nationally supported program of public-works construction, public works offer the only possibility for giving work to the unemployed. Congress, soon to assemble, has the great problem before it of recognizing the gravity of the situation and acknowledging its national character by placing the country's financial strength behind the relief effort of the cities. Without such aid, local construction can do but little to give work and earning power to the millions now without it.

A Battle Half Won

THE first hectic six months of construction at Hoover Dam have passed into history. Born in the record-breaking, unbearable heat of the past summer, the job is now running smoothly and is settling down to a steady six-year pull.

Faced with an administrative and humanitarian demand that men be put to work in the shortest possible time, engineers and contractors alike rushed the start of work under most trying conditions. Six Companies responded creditably, in disregard of accepted construction procedure and in the face of probable losses. Instead of adhering to the usual practice of having small crews prepare adequate facilities before the main body of men was put to work, hundreds of workers were given jobs at once, though Boulder City was still barren desert. The inevitable result was severe hardship for those employed. Abnormal summer heat—temperatures running more than twelve degrees above average—coupled with unfinished facilities resulted in decreased efficiency; yet work was continued, primarily to maintain employment.

As compensating factors, the same economic conditions which produced the unemployment made available a high grade of worker. Climatic conditions also were favorable in eliminating flood and high-water hazards, an important advantage when workmen were resorting to boat transportation and were trying to obtain a toehold on the canyon walls.

Charged with direction of activity, the Bureau of Reclamation has played its part well, though it had not intended to fling men into the heat of the desert summer without proper facilities. Restricted by organizational limitations and routine unknown to contracting procedure, the bureau has matched strides with the Six Companies in getting the project under way, and has concentrated every effort on rushing plans through and providing facilities at Boulder City. Its employees have struggled in the same heat and under the same handicaps, and are now ready with the contractors to look ahead.

Both organizations deserve much credit for what has been accomplished. The project had to start under great difficulties, and engineering and construction can be proud of the results thus far obtained on this giant undertaking. The battle of Hoover Dam has been half won.

High-Level Bridge Eliminates Old Swing Span

By C. H. SANDBERG
Assistant Engineer, Bridge Department, A.T.&S.F. Railway

New Illinois River bridge of Santa Fe Railway has through-truss channel span and continuous deck trusses —Studies of continuous trusses and ballasted decks

A HIGH-LEVEL fixed bridge that crossed and cut through the swing span of an older bridge over the Illinois River, necessitating special construction methods, is the principal structure on a 4½-mile relocation for line and grade improvement on the Santa Fe Railway System near Chillicothe, Ill. This cutoff, with little change in distance, eliminates 52½ deg. of curvature and reduces the sharpest curve from 7½ to 1 deg. At the river the grade line is raised to give 44 ft. of headroom at high water (68 ft. at low water), thus making a drawspan unnecessary. With the new location the bridge crosses the river at the same place as the old one but at a different angle, so that it actually intersects the latter at an angle of 20 deg. This is shown by the view of the completed new bridge (Fig. 1) and by the drawing (Fig. 2). The erection difficulties and methods are described in a following article.

This new double-track bridge has a through-truss channel span of 440 ft., giving a 360-ft. opening normal to the channel. Deck-truss spans flank it at both ends and the entire bridge carries a ballasted double track on a timber deck. All steelwork is far above high-water level, and the area of flood opening is increased from 45,000 to 56,000 sq.ft. The old bridge, built in 1887, had a 300-ft. swing span, six through-truss spans of 128 and 153 ft., and four girder spans; the bottom chords of the trusses were about 15 ft. above high-water level.

Approaches—On the new location the bridge approaches are fills each about 5,000 ft. long, with average and maximum heights of 53 and 65 ft., respectively. The construction of these approach fills was described in *Engineering News-Record*, Feb. 26, 1931, p. 364.

Substructure—All piers have rectangular bases that are of the reinforced-concrete caisson type and were sunk by open dredging, the shafts being built up as sinking proceeded. Bedrock is at about 30 ft. below the riverbed, or 44 ft. below normal water level. As the piers were taken about 2 ft. into the rock, it was necessary to use compressed air at all piers in order to complete the excavation, inspect the bottom and pour the seal in the dry. The concrete caissons in the river were laid out and constructed on artificial islands made by filling dredged material into areas surrounded by sheetpiling.

The maximum foundation pressure is 8 tons per sq.ft. from vertical loads and 16 tons with longitudinal force acting, this latter figure ignoring the passive resistance of the surrounding earth. Concrete was of 2,500-lb. strength for the caissons and 3,500-lb. for the shaft or neat work. In the abutments and piers the neat work is reinforced with ½-in. bars spaced 12 in. c. to c. in both directions and placed 4 in. from the surface, to prevent shrinkage and temperature cracks. Under each bridge shoe a closely spaced grillage of ½-in. bars was placed to distribute the loads from the bearings.

Superstructure—From the east (or Chicago) end the superstructure is as follows: 68-ft. girder span, 400-ft. two-span continuous deck truss, 470-ft. two-span continuous deck truss, 440-ft. skewed through-truss channel span, 235-ft. simple deck truss and 68-ft. girder span, making a total distance of 1,696 ft. between faces of

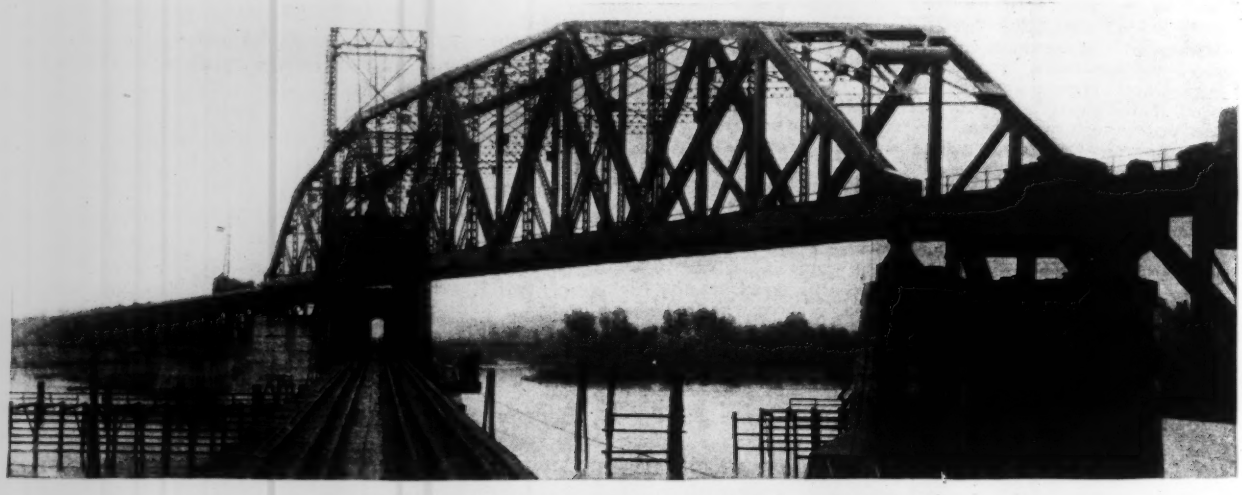


Fig. 1—New and old bridges over Illinois River, Santa Fe Railway

High-level fixed channel span intersects trusses of old low-level swing-span. Latter kept in service until new structure was completed.

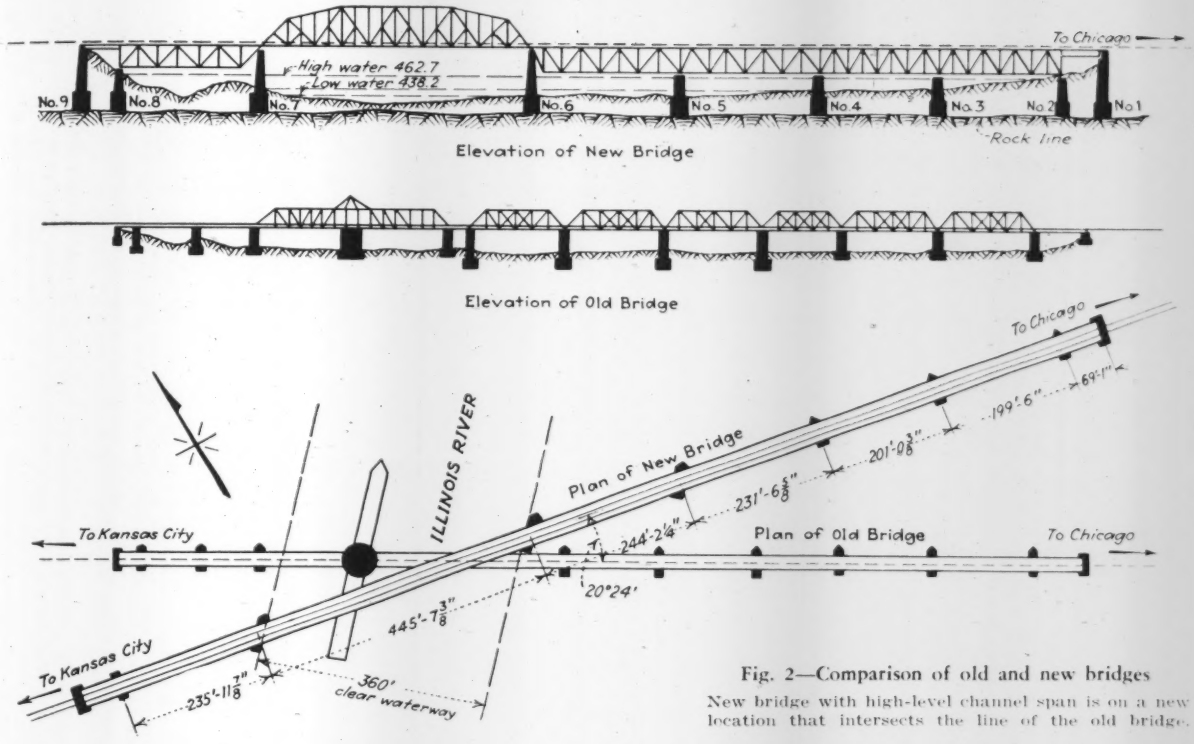


Fig. 2—Comparison of old and new bridges

New bridge with high-level channel span is on a new location that intersects the line of the old bridge.

abutments. All spans were designed for a double-track live load of Cooper's E-70 loading. The dead load for each span included a timber ballasted deck weighing 4,100 lb. per linear foot for the 440-ft. through truss and 4,370 lb. for the rest of the bridge. This floor construction is shown in Fig. 3.

Design was governed by the 1925 A.R.E.A. specifications, with some slight modifications. For traction and braking forces Waddell's formula was used. The Warren system of web bracing was adopted for all the trusses, because it was found to be the most economical for the continuous trusses and also because of its simplicity and good appearance.

Silicon steel was used for all the chords and the main diagonal members of the 440-ft. truss. For this steel the carbon-steel stresses were increased 50 per cent for tension and 40 per cent for compression. An investigation showed that in only two members were the secondary stresses more than the allowed one-third of the primary, amounting to 55 and 94 per cent. The sections of these two members were increased accordingly. Expansion devices on all the spans are of the single- and double-rocker type. The 235- and 440-ft. spans required two of these rockers, with an equalizer block on top (Fig. 3). The rockers for the 440-ft. span are of intermediate manganese steel.

Continuous-Truss Design—Rock foundation near the surface and the desirability of cantilever erection favored the use of the continuous trusses for the east end of the bridge. In the absence of published data on the relative economy of continuous ballasted-deck trusses, a study was made to determine what saving in metal could be effected by the use of this type of construction over that for simple spans. Three complete designs were made of symmetrical two-span continuous trusses with 200-, 250- and 300-ft. spans. The weight of steel for the truss with two 200-ft. spans figured practically the same as for two simple spans. With the 250-ft. spans there was a saving of 3 per cent in steel over that required for simple spans. This was on the basis of providing for reversals in stress. If reversals were not provided for, there was a saving of 4½ per cent. The 300-ft. spans showed a saving of 8 per cent in favor of the continuous trusses with reversals provided for, and 9 per cent if these were not considered.

In connection with this study an investigation was made as to the most economical depth of trusses. For the Sciotoville bridge over the Ohio River Mr. Lindenthal used a depth at midspan of $\frac{1}{6}$ of 0.8 of the span. For the previously mentioned designs on the 250- and 300-ft. spans the following depths were used: $\frac{1}{6}$ of 0.8 span, $\frac{1}{6}$ of 0.9 span and $\frac{1}{6}$ of the span length. The weights of chords and webs were figured. Using these depths, the ratios of the weight of the chords to the webs for the 250-ft. spans were 1.29, 1.05 and 0.895, respectively, and for the 300-ft. spans 1.25, 1.005 and 0.875, respectively.

It is known that the closer the weight of the chords approximates that of the webs the more economical the proportions of the span. Therefore, from the above it is noted that a depth of $\frac{1}{6}$ of 0.9 span length is the most economical for continuous spans of this type and length. The depth actually used for the continuous spans on this bridge was 33 ft. c. to c. of chords, this being 0.9 span divided by 5.5 for the 200-ft. span and by 6.5 for the 240-ft. span. The 33-ft. depth was an average taken to allow the common pier to have a level top.

With continuous trusses there is also an appreciable saving in concrete in the center piers due to the use of one large shoe in place of two shoes as for two simple spans. This saving in masonry is considerable for

double-track piers. The calculated saving in masonry and steel by the use of the continuous trusses on the east end of this bridge was approximately $20,000, exclusive of the saving in cost of erection by cantilevering and the consequent elimination of the large amount of falsework.

Two continuous trusses with spans 200-200 ft. were finally decided on for the east end of the bridge. The governing conditions that fixed the choice on the continuous type were: (1) rock foundation, which assured the permanence of the structural adjustments; (2) the desirability of cantilever erection; (3) economy in steel and masonry; and (4) the greater rigidity secured.

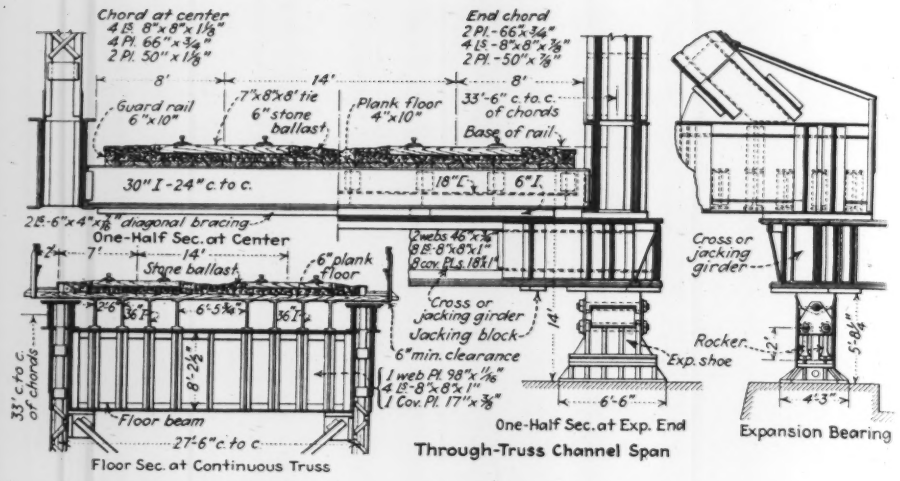


Fig. 3—Ballasted deck construction, Illinois River bridge

The greatest objection to continuous trusses has been the effect of settlement of the piers, but as there was rock foundation here this objection was eliminated. However, calculations were made for the truss with 200-ft. spans to see what effect on the stresses would come from a settlement of 1 in. at the end or center piers. These figures were made for the truss with the shorter spans, as the effect of settlement would be greater. Such a settlement at the end support will cause a relief in the end reaction amounting to 1.19 per cent of the total (*D* plus *L* plus *I*) reaction. The simultaneous increase in the center reaction will be 1.13 per cent of the total reaction at this point. A displacement of 1 in. at the center support will cause this reaction to be relieved by 2.26 per cent. It is evident from these values that even with spans as short as 200 ft. an ordinary settlement will not greatly affect the stresses.

Ballasted Floor Construction—One of the unusual features was the use of a ballasted deck for spans of this length. A diagram giving the steel weights of single-track ballated deck-truss spans is shown in Fig. 4. It was found that a 150-ft. single-track ballasted deck-truss span requires about 40 per cent more steel than the same truss span with open deck, and a 250-ft. span requires 30 per cent more steel. Even though the cost of ballasted-deck construction is considerable, it is thought that the following reasons warrant the excess expenditure over the cost of an open deck: (1) a better riding track is secured; (2) the track can be maintained by the regular section forces; (3) there is considerable protection of the floor framing from brine dripping from refrigerator cars; (4) the need of deck fire protection is eliminated; and (5) the effect of impact is greatly reduced.

On the continuous-truss spans the 36-in. I-beam stringers are covered with transverse creosoted planks 6x10 in., on which the ballast is 6 in. deep under the ties. Because of the high and long approach fills it was advantageous to make the floor system on the 440-ft. channel span as shallow as possible in order to reduce the distance from clearance line to rail level. Therefore, a transverse framing was used, consisting of 30-in. I-beams spaced 24 in. c. to c. and framed into the plate-girder lower chords (Fig. 3).

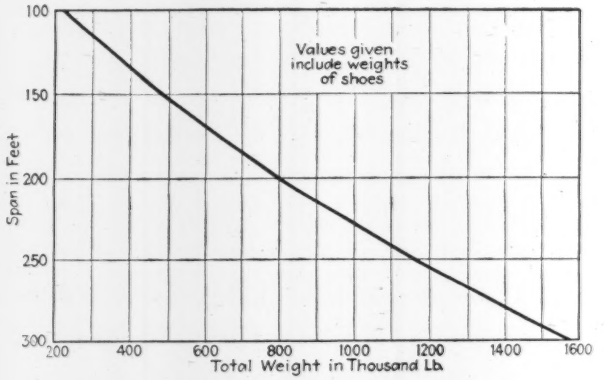


Fig. 4—Weights of ballasted deck-truss spans

Single track riveted deck or through-truss spans for Cooper's E-65 loading. For double-track, figures are increased 85 per cent. Plank deck with stone ballast.

There is an appreciable increase in steel required for a truss with this type of floor framing. For a recent 220-ft. double-track ballasted-deck truss of this type the increase in total weight of steel over that for a ballasted-deck truss span with floor beam and stringer framing was 29 per cent. On the 440-ft. truss span the floor consists of 4x10-in. creosoted planks laid longitudinally, with 6x10-in. curbs and 6 in. of stone ballast under the ties.

Engineers and Contractors—Grading was done by List & Wetherly, Kansas City, Mo., who sublet the hydraulic fills to the LaCrosse Dredging Co., LaCrosse, Wis. The Union Bridge & Construction Co., Kansas City, Mo., handled the substructure, while design, fabrication and erection of the steel was handled by the McClintic-Marshall Corp., Chicago. This project was carried out under the direction of G. W. Harris, chief engineer of the Atchison, Topeka & Santa Fe Railway System, while the preliminary design and final check of design and details was handled through R. A. Van Ness, bridge engineer of the system. It was under the direct control of H. W. Wagner, chief engineer of eastern lines, with B. H. Newlee, resident engineer, in field charge of the entire project, and H. N. Creel, assistant engineer, in direct charge of the bridge.

Cantilever Erection of Truss Bridge

By H. E. CRIDER
Manager of Erection, Western District
H. G. NEYENESCH
Assistant Resident Engineer, McClintic-Marshall Corp., Chicago

Methods employed on through-truss channel span and two-span continuous trusses—Part of top chord of old swing span removed to clear bottom of new fixed span

IN THE ERECTION of the Illinois River bridge for the Atchison, Topeka & Santa Fe Railway, cantilevering from temporary supports was employed on the channel span, which had also to be built about 4 ft. above its final elevation in order to pass clear over the old swing span. As already noted in the description of this bridge in the preceding article, the lines of the two bridges intersect over the channel and the swing span continued in use until all was ready for lowering the new span into position. In Fig. 1 is shown the erection equipment used. The erection diagram is shown in Fig. 3, while the progress record is given in Table I.

TABLE I—ERECTION RECORD, ILLINOIS RIVER BRIDGE, A.,T.&S.F. RAILWAY

	Deck Girder	Deck Truss	Through Truss	Continuous		Trusses—		Girder
	A	B	C	D	E	F	G	H
Schedule date of erection	12/10	12/31	3/6	3/24	4/16	5/9	6/2	6/6
Actual date	12/17	1/2	2/26	4/7	4/15	4/27	5/1	5/2
Tons of steel	94	1,016	2,939*	990	990	753	754	94
Rivets per ton	..	15½	21	17	17	17	17	12
Tons of steel per day	..	127	91	86	180	126	167	..
Rivets per day per gang	..	250	257	287	287	287	287	308

*Plus 425 tons of falsework, 3,364 tons.

Erection Equipment—A steel traveler was used, consisting of a 75-ton stiff-leg derrick on wheels (Fig. 1), but altered to permit its passage between the trusses of the through span while also clearing cars on a parallel material track. For this purpose one stiff-leg and one sill were shortened so that the over-all width was about 20 ft. For the deck spans the traveler rails were laid on the top chord and a stringer, while those of the material track were laid along the opposite chord and another stringer. On the through span, the transverse I-beams of the floor system were spaced 2 ft. c. to c., and it was possible to continue the same position of the tracks, the truss spacing being 33½ ft. c. to c., as compared with 27½ ft. on the deck spans. For the girder span of the west approach, where work was started, it was necessary to ship one east girder span knocked down, so that these girders could be erected temporarily on falsework outside of the span, to carry the outside rails of the traveler and material tracks.

A 10-hp. electric swinging engine operated the 5-ft. bull wheel of the traveler, while the hoisting was handled by a 135-hp. electric hoist equipped with three drums and four spools. Power was obtained by leasing a temporary 4,000-volt line from a dredging contractor and reducing the current to 220 volts through transformers. There were three electric compressors with a total output of 463 cu.ft. of air per minute, and one 110-cu.ft. gasoline compressor that was used as a supplementary power plant when cutting down the old piers. A 60-ton locomotive crane was used in the storage yard at Chillicothe to unload and reload materials, and a 40-ton locomotive crane supplemented the erection traveler by erecting bracing and removing falsework. Switching of cars between the Chillicothe storage yard and bridge site, a distance of 1½ miles, was handled by an 8-ton gasoline locomotive.

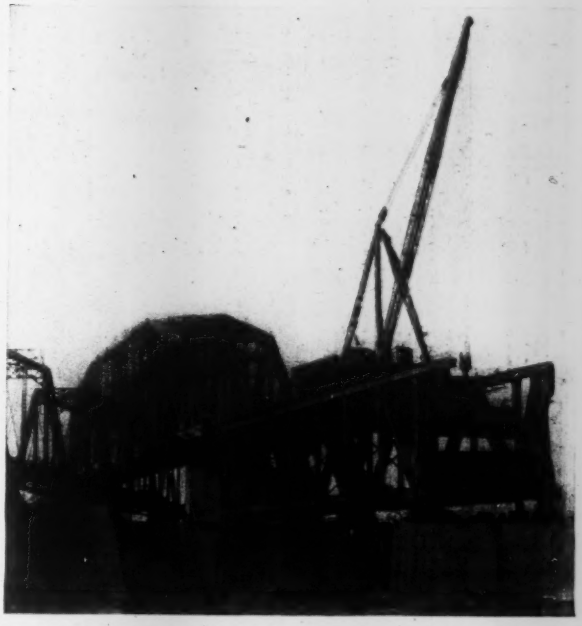


Fig. 1—Erecting a floor beam on 470-ft. continuous approach span of new Illinois River crossing of Santa Fe Railway

New channel span is raised temporarily on blocking to clear swing span of old bridge.

Method of Erection—The old single-track drawspan passed beneath the eastern end of the new through-span at an angle of approximately 20 deg. The original plan of the railway engineers was to cut the drawspan in two, supporting the eastern half on timber falsework and replacing the western half with an 87-ft. bascule girder span and a timber trestle. As the U. S. War Department refused to sanction the reduction of the river channel to 80 ft., a scheme for bobtailing the drawspan was then presented, but was rejected as being too expensive. The falsework permit issued by the U. S. District Engineer's office specified that a minimum horizontal channel of 100 ft. must be provided and that the drawspan must be free to operate at all times, except for a maximum period of fourteen days during the closed-navigation season. Also no falsework could be placed in the channel prior to Dec. 1, 1930.

To meet these conditions, the railroad then proposed to have the channel span erected 4 ft. above final elevation to permit operation of the old drawspan beneath it, cantilevering a sufficient number of panels to provide the 100-ft. minimum channel. When ready to transfer traffic to the new bridge, the drawspan would be swung over the rest piers and the downstream half removed, together with the three west panels of the old 150-ft. through-truss span adjacent to the east end, both of

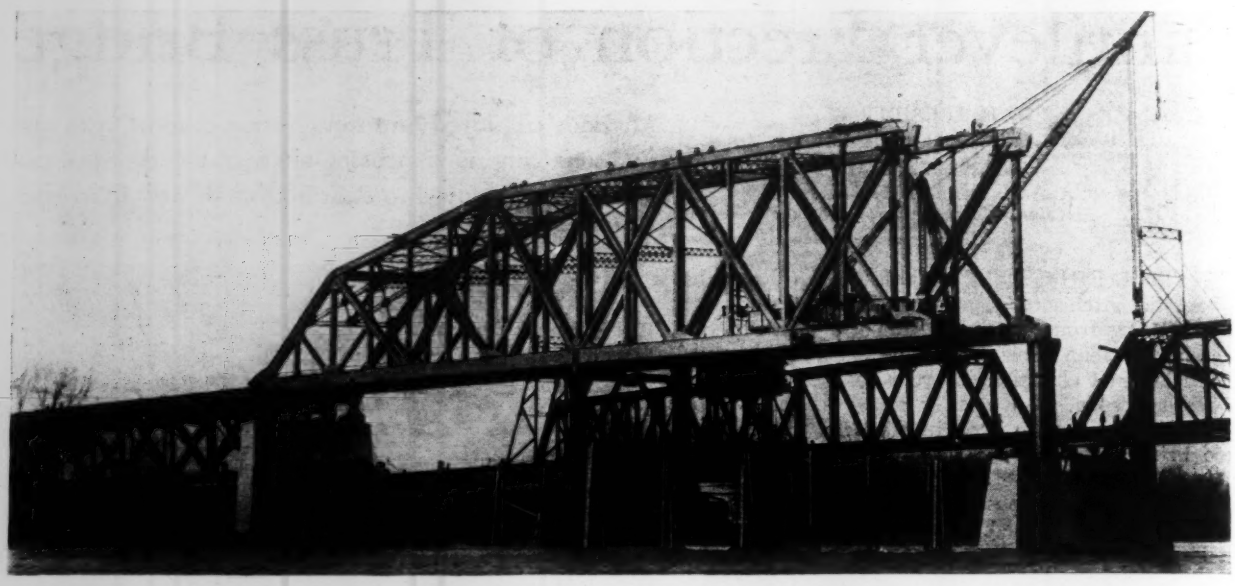


Fig. 2—Channel span was cantilevered 176 ft. from a steel bent on piling to a temporary bent on pier of old bridge
View shows traveler placing temporary bent with span cantilevered 132 ft.

which would interfere with lowering the new span to final position. This plan was approved by the U. S. District Engineer. Further studies by the erectors resulted in refinements that simplified erection procedure.

Simple Deck Span—The 230-ft. deck span at the west end was erected on timber pile falsework, each tower consisting of two bents of twenty piles each. To permit the operation of the traveler and crane over the bridge while the 440-ft. span was carried in high position, this deck span was inclined with its east end 4 ft. above final elevation.

Through-Truss Span—For this channel span, pile falsework cut off sufficiently low to permit the swing span to operate was driven parallel to the skewed floor at *L*-2, *L*-4, *L*-6 and *L*-8. The first three footings contained 26 piles each, and the other 192 piles. All of the piling was located west of the draw rest. An open river throughout the winter, in conjunction with low water, aided materially in completing these footings ahead of schedule.

The first six panels of floor and web members were then erected on steel falsework bents. On Jan. 21 the erection of steel falsework at *L*-8 began. As soon as the first 46-ton steel column was placed, the drawspan was unable to open fully, and the allowed fourteen-day period of closed navigation was in effect. The floor system and web members between *L*-6 and *L*-8 were then erected, and the traveler started back toward pier 7, erecting top chords and bracing as it went. As soon as the erected portion of the span had been swung, the steel bents were removed from *L*-2, *L*-4 and *L*-6, and the draw span was again free to operate, but in the opposite direction from that usually followed. The last steel bent was removed Feb. 4, just fourteen days after the setting of the first falsework column at *L*-8.

Starting from *L*-8 of the west end, cantilever erection carried the span to *L*-4 of the east end (176 ft.), where it was supported by a steel bent erected on the west pier of a 150-ft. truss span of the old bridge. In Fig. 2 (view taken Feb. 11, 1931) the trusses are cantilevered from *L*-8 to *L*-14, and the derrick is placing the 47-ton upstream column of the temporary bent for *L*-16 (or *L*-4 east). This bent straddled the west end of the trusses and was composed of two columns of unequal length, the upstream column being the longer, due to the fact that it fell outside the bearing surface of the pier and had to be supported by a grillage cantilevered from the pier slightly above water level. After the span had been swung from the steel bent at *L*-16, the remaining four panels were cantilevered to pier 6. As thus erected, the span was 4 ft. above its normal position. Except for six temporary web diagonals and extra anchor bolts for pier 7, no special fabricated material was required for the cantilever erection of this span.

Continuous-Truss Deck Spans—In the span adjacent to the channel span the trusses were erected in inclined position, with the west end 4 ft. above final elevation at pier 6 and the east end resting on the shoes on pier 4. This was done to meet the floor of the temporarily raised channel span. The west span of this first continuous truss was erected on timber-pile falsework with one five-pile bent and three towers, each tower consisting of two ten-pile bents. In Fig. 1 the derrick is placing the floor beam at panel point *U*-8 of the 470-ft. continuous span (April 6, 1931).

Successive cantilevering was used in erecting the remaining continuous-truss spans, and the adjacent ends of the trusses, where separated over the pier, were provided with temporary connections for this purpose. These connections were not, however, intended for cantilevering a complete span from pier to pier, since that would have involved considerable reinforcement of truss members. Therefore, in each span a pile bent was introduced at midspan. This bent was designed, however, to take a maximum load of only 500 tons.

A condition of statical indeterminateness was thus introduced, some of the cantilever stress being taken on the bent and some through the adjacent span. To relieve this condition, the actual load on the pile bents was maintained at the assumed figure through the use of a 500-ton hydraulic jack under each bottom chord, placed between the 200-ton wedge jacks that were on

each falsework bent. At the start of each stage the load taken by the bent was weighed on the jack gages and the blocking so adjusted that, at the end of the stage, the load did not exceed the allowed maximum. This was an economical arrangement, since the steelwork was permitted to carry cantilever erection loads up the point where reinforcement of truss members would have been required, and the midspan bent that was introduced was limited in size to that required to prevent overstress of the steel.

Lowering the Spans—During the erection of all the truss spans the necessary camber was maintained by the use of 200-ton wedge jacks, while the lowering of the channel span and the adjacent deck spans to final elevation and alignment was handled with 500-ton hydraulic jacking equipment. After the bridge had been erected complete and the deck timber had been shown in its blocked position with the shoes 4 ft. above the masonry and the four hydraulic jacks in position (July 15, 1931).

Lowering the Channel Span—The operating department of the railway set July 15 as the date for transferring traffic to the new bridge, and all trackwork and signal devices were completed at that time, with the exception of the closing rails on the channel span. At 6:33 a.m. the old drawspan was swung over the draw rest and securely wedged. Two minutes later burners began cutting its two interfering top chords and bracing, these being lowered to the deck by 8:30 a.m. Simultaneously, men began lowering the west end of the old 150-ft. through span, using four 100-ton self-lowering jacks. To obtain the necessary clearance, the west floor beam was lowered 42 in., slots having been previously cut in new pier 6 to eliminate interference with the

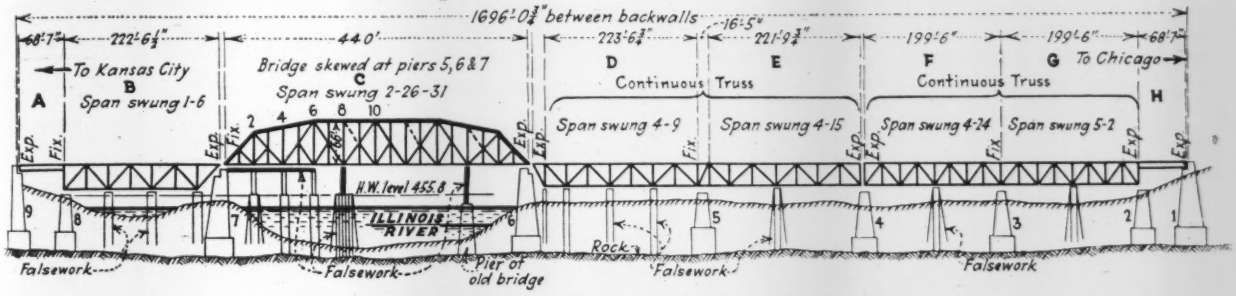


Fig. 3—Erection diagram, Illinois River bridge, A.T.&S.F. Railway

Note falsework supports for cantilevering. Steel falsework bent at panel-point 16 is mounted on pier of old bridge.

distributed, the deck spans were brought to final position, but the channel span was left resting on timber blocking in high position, since the east fill was not yet in condition to support the new roadbed, so that trains continued to operate over the old bridge. During the lowering of the continuous spans, the reactions were carefully weighed and were found to compare closely with the computed reactions.

On account of the skew in the 230- and 240-ft. continuous span the jacks were not placed directly under the stiffener angles provided on the jacking girders but were moved slightly one way or the other, so that the shoes at each end of the jacking girder were lifted simultaneously. Slight discrepancies between the observed and computed values, as shown in Table II, are probably due to the lack of uniformity in steel distribution and the fact that the weight of the timber deck had to be assumed. Before leaving the bridge site at the conclusion of the first operation the eight 500-ton hydraulic jacks were placed under the channel span, two at each point, and connected to the pump in readiness for the jacking operation to follow later. A steam hoist and a 55-ft. boom were erected on the downstream truss of the channel span for use in dismantling half of the old drawspan, and whatever falsework was needed to supplement the draw rest-supports was placed in position. In Fig. 4 one end of the channel span is

TABLE II—REACTIONS IN CONTINUOUS SPANS

199½–199½-Ft. Spans		230–240-Ft. Skewed Spans	
Calculated	Observed	Calculated	Observed
L_0 — 326K	310K	U_1 — 454K	457K
L_8 —1,016K	1,048K	L_9 —1,320K	1,344K
L_{16}— 384K	368K	L_{16}— 376K	368K
		U_0 — 414K	423K
		L_8 —1,361K	1,376K
K = 1,000 lb.		L_{16}— 407K	392K

bottom chord eyebars on the upstream side of the 150-ft. span. This began at 6:40 and was completed at 9:30.

At 8:40 a.m. the task of lowering approximately 3,800 tons of channel-span steel, deck and ballast began, and it continued from the two piers in alternate stages until it was finally landed on the shoes at 12.33 p.m. Telephone communication between the two crews greatly facilitated this jacking operation. When the closing rails at the west end were inserted, it was found that the span must be jacked westward about 4 in. To shift the channel span, the same method was used as had been followed on the continuous spans. A strip of soft 1-in plank, about 2 in. wide, was placed between the base of the jack and the supporting rail grillage, causing the jack to tilt about 2 in. out of plumb in the opposite direction to that in which the span was to be moved. All of the jacks at the fixed end of the span were set in this manner, and the pump was then started. As the jacks took the load, the timber strips crushed and allowed the jacks to return to a perpendicular position, carrying the span with them. The first few tiltings resulted in movements of about ¾ in. each, but these gradually decreased for some unknown reason, until at the last, movements of only ⅛ in. were obtained. By 1:55 p.m. the rails had been sufficiently closed to permit the first train to cross the new bridge, and at 2:55 p.m. the span was in its final position.

A few days later the downstream half of the drawspan was removed, and by July 23 all tools and equipment had been loaded out. The rest of the old bridge was dismantled by the substructure contractor, river equipment being used. A total of 7,630 tons of steel, exclusive of falsework, was erected in place in about 85 working days, allowing for delays from inclement

weather. This was an average of 90 tons per day. The maximum erected in any one day on each span was 188 tons for the two girder spans, 150 for the simple deck span, 160 for the channel span and 191 tons for the continuous spans.

Special Features in Fabrication—The deck spans were fabricated in line with common practice, which requires all holes in chord splices and gusset connections to be subpunched and then reamed after the trusses are assembled in cambered position. However, only one-third of the splice and gusset connections were subpunched, the rest of the holes being drilled from the solid metal.

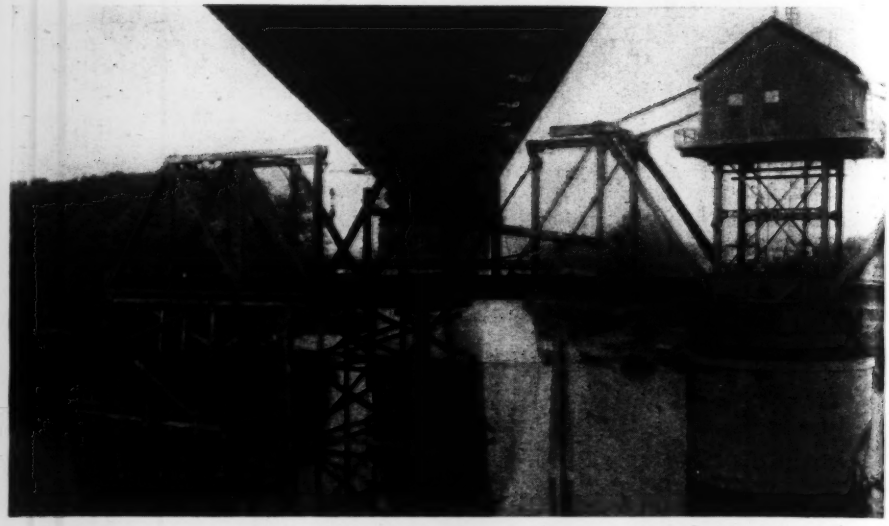


Fig. 4—Removing old swing span with new fixed span in operation above

In the 440-ft. span each half-section of chord (except for the lacing and batten-plate holes in the outstanding legs of the chord section) was assembled in a specially designed form without any of the material having been previously punched or drilled. Milled ends of plates and angles were accurately located by gages. All holes in the web of the chord section were then drilled from the solid. Diaphragm holes in the chord were drilled to a steel templet, as were also the connection holes in the riveted diaphragm, thus eliminating further reaming after the chord sections were boxed.

Open holes in the gusset-plate connections for web members, together with the same connection holes in the web members, were subpunched and then reamed. The chord splices, however, were drilled from the solid, one-third of the holes having been subdrilled previously for fitting-up. Instead of assembling the truss complete, only the top and bottom chords were laid down, each chord maintaining the normal angular relation of component parts with one another. This "normal" position is that which the members are intended to assume with the truss span fully loaded, and it is a straight line for the bottom chord.

In the floor system the transverse I-beams were separated by two lines of diaphragms. To insure proper alignment when erected, the diaphragm holes were punched full size and the end-connection holes in each beam were left blank. A templet for all the web holes was then pinned to the diaphragm holes, and the end-connection holes were drilled from the solid with portable drills. Tapered rivets were used for all grips of 4 in. or more.

Special Features of Erection—For that portion of the 440-ft. span erected on falsework the lower chords were erected and riveted in horizontal position and then jacked to their cambered position. Erection of web members, top chords and bracing followed in proper sequence. Since the chord splices and gusset connections for web members had been reamed for normal position of the truss, initial bending of the web members was required in order to erect them, these stresses neutralizing the final secondary stresses. Truss members were pulled into place with drift pins, except that for a few members that could not be bent these connections were made by jacking under the end bearings.

Fig. 5—Blocking and jacks under 440-ft. span

This span was erected 4 ft. above grade to clear top of old swing span. Jacks are in position for lowering.

None of the top-chord splices were driven until the span had been swung, but web connections were driven as soon as the holes were in alignment, about half of these web connections being driven complete before the span was swung. No holes were reamed in the field, and no unusual difficulty was encountered in making any of the connections. Riveting followed the erection of members as closely as possible, except in the case of the top-chord splices. The percentage of cut-outs was only 1.21 of the total number of field rivets and was due to the following causes: (1) careful shop fabrication; (2) use of air-jam dollies; (3) use of high-pressure air at 130 to 140 lb.; (4) use of tapered rivets for all grips of four or more; (5) method used in driving the rivets, the field head not being completed until after the rivet had cooled slightly.

Personnel—In collaboration with the bridge department of the Atchison, Topeka & Santa Fe Railway, the design was prepared by Jonathan Jones, chief engineer of the McClintic-Marshall Corp., who also supervised the engineering principles of the erection plan. The field work was under the supervision of H. E. Crider, manager of erection (Western district).

Six Years' Experience With Rubber Pavement in Chicago

Heavily traveled Michigan Ave. bridge provides severe test for material— Fastening to base proves difficult

PAVEMENTS on lift bridges are subjected to many special limitations, not the least of which are the requirements of lightness and ability to adhere to the supporting framework. When there is added the necessity of withstanding the wear of heavy bus and automobile traffic, the problem becomes one on which original cost may not be the prime factor. The following account of the experience with rubber-tile pavement on one of the most heavily traveled bridges in Chicago is highly illuminating and valuable.

—EDITOR.

RUBBER TILES as a paving material have been in use for almost seven years on the Michigan Ave. lift bridge in Chicago, Ill., which carries an average daily traffic of 50,000 automobiles and buses, with a peak load of 80,000 recorded by actual traffic count. Pavement wear is severe, not only because of the large number of vehicles, but also because traffic lights at each end of the bridge necessitate frequent stopping and starting on the structure. From the engineers in the bridge maintenance department of the city engineer's office of Chicago the following information has been obtained.

Upper Level

The Michigan Ave. bridge, upper level, was originally paved with 4-in. creosoted wood blocks. These proved quite slippery to automobile traffic and caused many accidents. Machines would run up on the sidewalk or be forced over the center curb into the opposite roadway. As noted in *ENR*, Nov. 13, 1924, p. 795, it was necessary to install bulb angles 8 in. deep at the top of the existing curb, making a total height of 14 in., to keep skidding vehicles in the roadway.

A skidding test was made on a 100-ft. strip of rubber pavement laid on the Eads bridge in St. Louis. Water was kept running on the rubber, and several stops were made at a speed of 25 m.p.h. No skidding occurred. On the dry rubber the stopping distance was shorter than on wood-block pavement that had just been recoated with small gravel.

After further investigation of rubber pavements laid in various parts of the country, an experimental pavement was installed on the west roadway of the south leaf of the bridge, using patented 6x12-in. rubber tiles 1 in. thick. The original 6x12-in. plank subfloor was covered with $2\frac{1}{2}$x$3\frac{1}{4}$-in. fir as a base for the tiles, which were designed with six interlocking ears about $\frac{3}{16}$ in. thick. These tiles were held down by three No. 12 drive screws, $2\frac{1}{2}$ in. long, passing through the ears. The cost of the rubber tiles was $1.30 per square foot, the work being completed in October, 1924. Under the heavy and continuous traffic the ears of the blocks broke off, thus allowing the tiles to loosen. Consequently, in May, 1925, it was found necessary to face-nail each block with six 50-penny spikes.

The net result, after one year of observation, was such that it was decided to repave the remaining three-fourths of the upper level of the bridge with rubber paving $1\frac{1}{4}$ in. thick, with an increase in ear thickness from $\frac{3}{16}$ to $\frac{3}{8}$ in. Upon the recommendation of the manufacturer the faces of the tiles were provided with three countersunk holes to receive drive screws and washers; however, 50-penny nails were substituted for

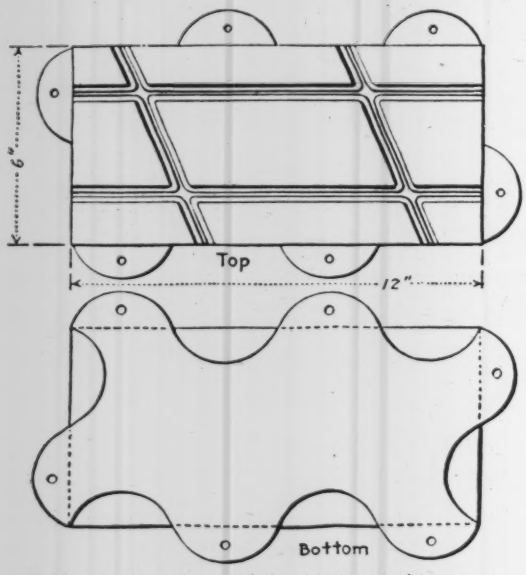
First installation of rubber pavement on Michigan Ave. bridge, Chicago

the drive screws in the installation. The holes were filled with asphalt after nailing, which, together with V-grooves in the surface, provided additional resistance against skidding.

Subfloor

The subfloor was identical with that previously described except that, for the upper subfloor, 3x4-in. tongue-and-grooved fir was substituted for that with plain sides. In the first pavement cracks in the floor had made an imperfect surface for the tiles to rest on. The cost of the rubber blocks was $1.50 per square foot. This installation was completed in June, 1927.

Toward the latter part of 1927 the original 1-in. rubber blocks on the southwest quarter became worn, warped, loose and quite slippery, to such an extent that they were counterbored and the openings filled with carborundum and asphalt mastic, with the object of



Rubber-paving tile molded with interlocking ears

Thickness varies from 1 to 1½ in. Countersunk holes for nails not shown.

making a non-slipping pavement. This experiment did not prove satisfactory. The blocks by this time were in such a bad condition that it was decided to pull them up and replace them with blocks 1½ in. thick, similar to the 1¼-in. blocks in all other respects. They were installed in July, 1928. The cost was $1.50 per square foot.

It has been found that the deflections and movement of the blocks tend to pry loose the nails holding them. The wear on the surface of the blocks is not great, but there is a great tendency to chafe and wear the under blocking, as a result of slippage under traction, which causes further loosening of the blocks, necessitating renailing or resetting of the nails from time to time. After the tiles become slightly worn and covered with oil and grease from passing automobiles, they become very slippery and in that respect are not as skid-free as was anticipated.

Costs of maintenance are higher than they might be on a less-traveled bridge, since practically all repairs are done on double time, Sundays or late at night. A figure of 25c. per yard per year was given. It is stated that it is safe to say that a life of at least four years may be reasonably expected on this particular bridge.

As noted in *Engineering News-Record*, Oct. 16, 193 p. 631, a large variety of bridge-paving materials w placed on the south side of the Lake St. bridge in t fall of 1930. The three test sections of rubber vary i length from 14 ft. to 16 ft. One section is 6x12x1¼-i and one of 12x12x1¼-in. dimensions nailed and screwe to 3x4-in. matched, dressed and treated fir plankin on 6x12-in. treated subplanking, mopped with asphal and bolted to the stringers. The third section is o 6x12x2-in. rubber tile on 2x6-in. matched and dresse fir. One of the 1¼-in. sections is fastened with No. 2 roundhead screws 4 in. long through rubber-plugge countersunk holes. The other two sections are naile down with 50-penny spikes through countersunk hole plugged with rubber.

Periodic Tests to Prevent Sewer Explosions

The dangers of explosions resulting from the leakage of illuminating gas into sewers or the dumping of gasoline into them were fully discussed by J. J. Jessup, city engineer of Los Angeles, before the Pittsburgh convention of the American Society of Municipal Engineers. He pointed out in the beginning that the space in the sewers above the surface of the liquid should be thoroughly ventilated. Combustible gas sometimes collects in manholes, and the explosion and fire hazard then is great. Ignition of the gas has been caused by electric sparks due to short circuits or the passage of street cars. Two years ago a serious explosion occurred in Los Angeles in which 30 manholes were blown several feet in the air. Surveys of the manholes made immediately after the explosion indicated that many contained considerable quantities of explosive gas. The condition was traced to oil refineries that were disposing of gasoline by dumping it into sewers. A portable combustible gas indicator was obtained and a series of tests was made to disclose conditions of the city sewer system. Results indicated that 21 per cent of the manholes that were examined contained gas in quantities above the danger point.

The leakage of illuminating gas into the sewers was shown to be a great hazard. Such a condition can easily arise from a broken gas main resulting from street settlement or other cause. The U. S. Bureau of Mines has made a study of explosive conditions in the electric manholes in Boston. There they found 107 out of 1,765 manholes tested containing combustible gases. Manholes in the outlying districts were usually free of gas. Carbon monoxide and hydrogen were present in all tests where combustibles were found in serious quantities. It was concluded, therefore, that leakage of manufactured gas was the chief source. After repairs to the gas mains were completed in the vicinity of danger spots, explosive conditions soon disappeared. In no case was gasoline detected.

In conclusion, it was pointed out that although leakage of illuminating gas is the most frequent source of trouble, the disposal of gasoline into sewers is not accidental and should be prevented. Periodical examinations of air in sewer manholes should be included in sewer maintenance. Cooperation with the local gas company should be required whenever manhole tests reveal explosive conditions.

Corrugated-Iron Pipe of Multi-Plate Design Introduced on Illinois Central Railroad

THE FIRST INSTALLATION of a large-diameter corrugated-iron culvert pipe of a new type has recently been completed on the main line of the Illinois Central Railroad, at Jackson, Miss. The pipe is of multi-plate design, made up of a number of circular segments bolted together in the field to form a culvert 90 in. in diameter. It replaces an old brick-and-concrete-arch culvert 10½ ft. high, 8½ ft. wide and 125 ft. long, and was in fact placed inside of this culvert after being assembled into sections 10 to 20 ft. in length.

Half the length of the old culvert was constructed about 75 years ago and is of brick on timber mud sills, while the other half, which is of concrete, was constructed in 1901 to care for an additional track. In 1917 cracks began to develop in the brick portion of the culvert, and in subsequent years numerous efforts at repair, including both lining of the culvert and strengthening of the foundation, proved costly. Recently the condition of the culvert became so bad that extensive repair or entire rebuilding became imperative. It was decided to reline the old culvert with a 90-in.-diameter corrugated-iron pipe and to jack a 60-in. corrugated-iron paved-invert pipe through the embankment beside the arch to provide additional capacity.

The Pipe—Multi-plate pipe is a development of the Armco Culvert Manufacturers' Association. It is similar to corrugated-iron pipe now in use except that it is of large diameter and made of heavy plates with large corrugations (6 in. from crest to crest and 1½ in. deep) and rolled to circular segments that are assembled in the field by bolting the plates together instead of being shop-fabricated complete.

In the manufacturing process the plates are first sheared 52x139½ in., which reduces to 52x120 in. after corrugating. Half-length plates are also made. The plates are then match-punched, curved to the desired shape and galvanized. The plates are shipped nested, and in the field four, five, six, seven or eight plates are bolted together to form 60-, 75-, 90-, 105- or 120-in.-diameter pipe, respectively. On the first installation, described here, the 90-in. size was used.

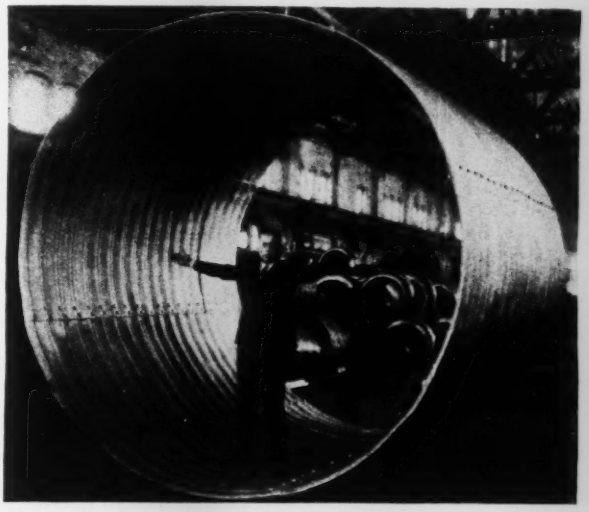


Fig. 2—Shop assembly of 90-in. milti-plate iron culvert pipe

In assembling the plates in the field the circumferential joints are broken by staggering the plates so that continuous pipe in any multiple length of 5 ft. can be made without a circumferential seam. The plates are lapped 4½ in. in the longitudinal seams, and the bolts, one in each crest and valley are staggered 2 in. apart.

Among the advantages claimed for this new pipe are: (1) great strength, because of flexible-type construction, use of heavy-gage plates and wide and deep corruga-

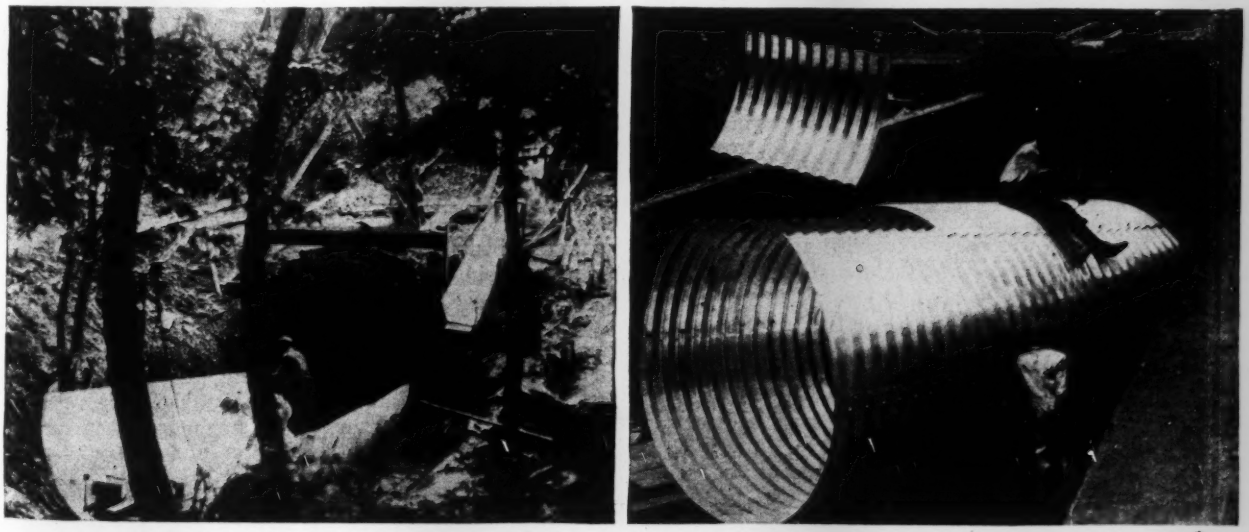


Fig. 1—Assembling multi-plate corrugated-iron pipe prior to installation in old masonry and concrete culvert

tions; (2) durability, by virtue of the heavy-gage plates and an extra heavy coat of pure zinc; (3) economy, because heavier-gage plates may be used for the bottom segment where the greatest wears occurs, with lighter-gage plates for the remainder of the periphery; (4) low renewal cost, because the invert plate, the first to wear out, can be replaced without removing the pipe; (5) low first cost, because of an inexpensive method of fabrication and an efficient distribution of metal due to the balanced design. (It is also pointed out that the plates, being shipped nested, enjoy a lower freight rate than shop-fabricated pipe); and (6) special adaptability to jobs requiring pipe installation by jacking, because the method of assembly permits extension of the pipe without the use of circumferential bands or the matching of holes for riveting.

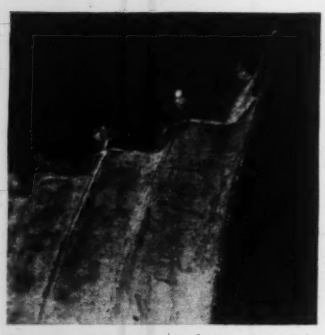


Fig. 3—Segments of new multi-plate pipe are assembled into circular sections by means of bolts

MAKE-UP AND WEIGHT OF PIPES IN AVAILABLE DIAMETERS

Diameter, In.	Gage		Total Weight Lb. Per Foot
	Upper Portion	Invert	
60	8	5	163.2
75	8	5	201.5
90	5	3	295.9
105	5	3	344.1
120	5	3	392.3

LABOR REQUIRED FOR ASSEMBLY OF 90-IN.-DIA. SECTIONS

Length of Section, Ft.	Lifting Equipment Used	Number of Laborers	Man-Hours of Labor	Man-Hours of Supervision
15	Crane	4	23	5¾
10	Block and tackle	4	13	3¼
20	None	8	42	5¼
10	Block and tackle	4	15	3¾

Pipe Assembly—The 90-in. pipe was received on the Jackson job in segments (six segments making a ring) and assembled into sections outside of the arch. With the exception of one section 15 ft. and one 20 ft. long, made necessary by a 5-deg. curve in the old culvert, all sections were 10 ft. in length. The invert segment where the wear will be greatest is of 5-gage ($\frac{7}{32}$-in.) metal, while 8-gage ($\frac{1}{6}\frac{4}{4}$-in.) metal is used for the rest of the segments.

In assembling the pipe outside the arch the 5-gage inverted plate was placed first and the 8-gage side plates added, using only sufficient bolts (about six) in each seam to hold the plates in position. Following installation of the top plate, all the remaining bolts were placed and tightened. In assembling the sections care was taken to see that all downstream plates were placed outside the adjacent upstream plates.

Part of the pipe was assembled with a hand-operated crane, part with a block and tackle, and part manually. With the crane and the block and tackle, only four men and a foreman were required. When no lifting equipment was employed, eight men and a foreman were used.

With negro labor at 20c. per hour, the average cost of assembly, not including cost of foreman, overhead supervision, lost time, etc., was 33.8c. per foot. The maximum cost on the 20-ft. section, where no lifting equipment was used, was 42c. per foot. The minimum cost was 26c. per foot for the first 10-ft. section on which the block and tackle lifted the side and top plates. These figures include all labor (except foreman's necessary from the time the plates were picked up at top of the embankment until the pipe was ready to be moved into place.

Installation—In Fig. 4 is shown a sketch of the completed new culvert. The contract required that a new foundation of concrete be placed in the old arch, shaped to receive the new pipe and that the annular space between the new pipe and the culvert be filled with 1:3 grout.

The outside diameter of the pipe was greater than the horizontal width of the arch at the brick end where

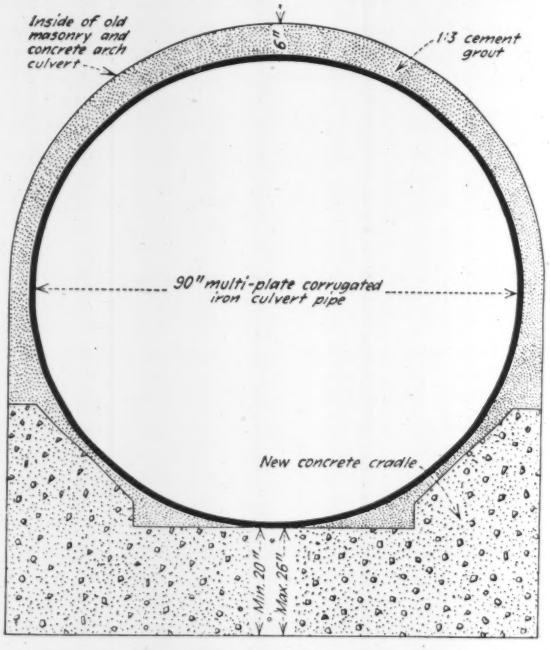


Fig. 4—First installation of multi-plate culvert pipe was used to reline old masonry and concrete railroad culvert

100 ft. of pipe had to enter. It was, therefore, necessary to decrease the horizontal diameter of the pipe about 4 in., and this was done by means of vertical struts that elongated the vertical diameter. After the pipe was moved into the old culvert a distance of about 30 ft., the arch became wide enough so that the struts could be removed.

As the sections were assembled they were moved into place by using a crane hoist at the opposite end of the culvert, pulling directly on the pipe. Where possible, the pipe rested or skidded on a plank, thus protecting the galvanizing. With four men on the hoist and two men with pinch bars at the back end, a 10-ft. section was moved approximately 90 ft. in 20 min.

In this installation, where the pipe was threaded into an opening in places not as wide as the pipe itself, all bolts were placed from the outside with the nuts on the inside. Generally, the reverse practice would be desirable, with the bolt heads placed in the valleys to prevent them from turning and the nuts on the crests on the outside. The bolt holes in the plates were punched $\frac{3}{4}$ in. for $\frac{5}{8}$-in. bolts. Matching was easily accomplished by means of drift pins, and this was particularly necessary at the intersection of circumferential and longitudinal seams where three thicknesses of metal occurrred. The bolts used were standard iron bolts, cadmium-plated, in lengths of 1 and $1\frac{1}{2}$ in.

Guniting the slopes of the Westcott distributing reservoir of the Syracuse, N. Y., waterworks

Experiments in Gunite Control at Syracuse Reservoir

Field and laboratory tests of gunite lining disclose important relations of nozzle velocity, water content and sand gradation to strength and absorption

By E. P. STEWART
Division Engineer of Water Supply, Department of Engineering, Syracuse, N. Y.

NEW DATA on gunite control have been secured in constructing the lining for the Westcott Reservoir for the water supply of Syracuse, N. Y. Experiments carried out in the laboratory and in the field during actual lining operations disclosed important relations between strength and absorption and the nozzle velocity, cement-water ratio and fineness coefficient of the sand. In addition to the research results obtained, the reservoir work at Syracuse stands as one of the large-area operations in guniting practice.

Reservoir Structure—The Westcott Reservoir is a lined-earth distributing reservoir of 107,000,000-gal. capacity. It is 1,090 ft. long, 250 ft. wide and 40 ft. deep with inside bank slopes of 1 on 2 and 87 ft. wide. The ends of the reservoir are semicircles.

The plans called for 3½ in. of gunite directly on the clay bottom, but a 6-in. crushed-stone under-lining was required on the slopes to provide drainage. A 6-in. tile drain with open joints was installed at the toe of the slope and connected to a cast-iron drain that extends through the embankment. An anchor wall was constructed about half way down the slope to prevent sliding of the under-lining and buckling or sliding of the lining.

Expansion joints were installed on the slopes, extending from the curb to the toe wall at intervals of about 120 ft. The bottom lining was laid out in panels of about the same dimension. Each joint was supported by a concrete batten 5 in. deep and 21 in. wide, the top of which was at the elevation of the bottom of the lining. The batten was coated with hot pitch, thus forming a smooth surface for a slip joint.

Vertical spacers were then placed along the center of the battens, and the gunite panels shot. These provided spaces between panels for expansion joints, which were filled with plastic material. An 8-in. copper strip, crimped V-shape to permit expansion, was set in the gunite slabs at the joints to act as water stops. The space above the copper was filled with plastic material.

Although these joints were difficult to construct properly and required constant vigilance on the part of the inspectors to secure good work, they have proven to be waterproof.

Gunite Bid Lowest—Bids were received on three types of lining: (1) all gunite, 3½ in. thick; (2) sides 3½-in. gunite; bottom 16x40 ft., 7-in. concrete slabs with copper joints between slabs; and (3) all-concrete lining of same construction as bottom in type 2. All three plans called for a 6-in. stone facing on the upper 20 ft. of the slope. The low bids on the three types were respectively $271,692.50, $305,665.30 and $314,955.30. The contract was awarded to I. M. Ludington's Sons, Inc., of Rochester, N. Y., for type 1, because it was the lowest total bid and because some doubt was entertained of the practicability of pouring 7 in. of concrete on a 1 on 2 slope, especially as this slope is 87 ft. long. The Ludington Co. sublet the gunite work to the Wertz Co., of Cleveland, Ohio.

General Lining Procedure—The gunite was placed in two layers. A 1-in. layer was placed first, on which was laid reinforcing mesh. This was 6x6 in., No. 1, galvanized, electrically welded, steel wire in sheets 8x16 ft. Placing in two layers insured the position of the mesh in the lining.

Work was begun during August, 1930, and continued until cold weather in November, about two-thirds of the

lining being completed at this time. Several of the largest cement guns available were used. However, the material hose and nozzles used were larger than the standard equipment ordinarily furnished.

Velocity of Shooting Questioned—The work had been in progress but a short time when the question arose whether the gunite was being shot at the proper velocity. The specifications required a pressure of 35 lb. at the nozzle instead of a particular pressure at the gun, on the theory that the nozzle velocity is an important factor in securing the best gunite and that the pressure at the nozzle is a better measure of nozzle velocity than pressure at the gun. It was soon found, however, that the pressure at the nozzle is always difficult to determine and that it is sometimes impossible to ascertain it due to the clogging of the measuring gages.

Fig. 1—Arrangement of apparatus for laboratory studies of gunite

As the equipment consisted of $1\frac{3}{4}$-in. hose and $1\frac{1}{2}$-in. nozzles, definite data were not found of the pressure that should be used on a cement gun with this larger equipment. Rough field checks showed that the nozzle velocity was somewhat lower than that used in standard practice. The contractor then increased this velocity by using a $1\frac{1}{4}$- instead of $1\frac{1}{2}$-in. nozzle.

Readings of the pressure at the cement guns were taken while using the new nozzle, and an attempt was made to regulate nozzle velocities by maintaining the cement-gun pressures as determined by the field check.

Samples of the gunite were shot at various times. From these and from the finished panels the cores were bored and tested in the laboratory for seven-day compressive strength. These tests showed that increased nozzle velocity and a lower water-cement ratio raised the average strength about 700 lb. per sq.in.

It was found that very few data are available on the proper pressures and velocities to be used to secure the best gunite. The Cement Gun Co., originator of the cement gun, has recommended a nozzle velocity of about 300 ft. per second, and gun pressures varying from 30 to 70 lb. per square inch, depending on the equipment used. However, it had no data on gun pressures for such large hose and nozzles. Moreover, no method was available for determining nozzle velocity at all times. In fact there seemed to be very few accurate data available on any of the factors that determine the quality of gunite.

Laboratory Experiments

Based on the experience outlined, a series of experiments was undertaken to determine what factors affect the quality of gunite and how these should be controlled to get the best results. It was assumed that the factors essential in securing the best gunite are (1) nozzle velocity; (2) water-cement ratio, and (3) fineness modulus of sand. The Cement-Gun Co., manufacturers of the cement gun, was invited to cooperate in these experiments which they did, furnishing an N-O gun and an operator.

Devising a Nozzle-Velocity Meter—The engineers of the division of water designed and constructed an apparatus to show true nozzle velocity. This consisted of a segmental thin-plate orifice introduced into the air-feed pipe of the cement gun at right angles to the pipe, and a manometer suitably calibrated to show the quantity of air passing by the orifice. The segmental orifice measures the flow of air in a manner similar to a venturi tube, producing a differential pressure across the orifice, which bears a relation to the quantity of air passing the orifice. As all of the air entering the lower chamber of the gun must pass through the material hose and nozzle, it follows that the velocity at the nozzle can be readily computed when the amount of air passing the orifice is known. A scale reading directly in nozzle velocity in feet per second was computed and attached to the manometer.

Experiments Undertaken—The first experiment was shooting samples of gunite at various nozzle velocities, maintaining a constant water-cement ratio. While shooting each sample the velocity was held constant by controlling the quantity of air entering the cement gun. Six samples were shot at six different velocities. Fig. 1 shows the set-up of the cement gun and other apparatus and the booth in which the samples were made. Measurements of the material (including water) put into the gun were taken for each sample, and the weight of the sample and the rebound was measured at the end of the run. The water used was measured through a special meter. Velocities were read on the apparatus devised for this purpose.

The second experiment was made with a nozzle velocity constant at the value which gave the best results in the first experiment. Samples were then shot, using a different water-cement ratio for each. The moisture was varied from as dry as possible to a wet condition, which was obviously impractical. All materials were measured, including the rebound, so that the effect of the water-cement ratio on the quantity of rebound could be studied.

The next experiment was a study of the relation of compressive strength of gunite to the fineness modulus of the sand. Data were also taken on the rebound as in the previous tests. Five different gradations of sand were used, the sand having been previously sieved and mixed in the proportions shown on the accompanying curves. The fineness modulus shown on these curves is not the standard one, but it was developed during these experiments and henceforth in this paper will be called fineness coefficient.

The fineness coefficient was derived by plotting, on a Tyler standard screen-scale cumulative diagram (Fig. 2).

the sieve analysis of each gradation of sand used in the test. Then, to find the fineness coefficient, the maximum ordinate was found for each of the curves drawn in the sieve analysis. The length of this ordinate divided by the length of the line of perfect crushing gives a ratio, and it is obvious from the attached curve that the higher the ratio or coefficient the finer the sand.

In this experiment the velocity and water-cement ratio were held as constant as practicable at a value of each that was found by previous tests to be best.

A second and third series of experiments were run to check the results of the first. One run only was made on the fineness coefficient, and in the last series of experiments two runs instead of one were made on the velocity tests.

Making and Testing Samples—On the Westcott Reservoir the cores were bored from the finished work and from samples made for this purpose. A calyx drill was used, and specimens were bored $1\frac{3}{4}$x$3\frac{1}{2}$ in. To bore such small cores, and at the same time obtain a core smooth enough to determine accurately the section area, is a slow process.

One of the purposes of these experiments was to determine a method of sampling that might be easier than the method used at Westcott Reservoir. The method tried in the first series of experiments was to push 2-in. thin metal tubes through the sample while it was still fresh enough to do so without disturbing the structure of the gunite. Specimens were also cored from the sample to check this new method. In general, the results of this method were not satisfactory; the aggregate at the surface of the core was disturbed to such an extent as to make it difficult to determine accurately the effective section area. While the results in general checked those of the cored specimens, they were not sufficiently uniform throughout the test to be satisfactory.

In the second series of experiments the specimens were taken by the same method as in the first with approximately the same result.

In the third series all of the specimens, except those cored, were shot into forms open on each end and at the top, forming rectangular blocks 3x3x6 in. The forms were made by standing sheet-metal plates in vertical slots in a board. The forms were oiled with mineral oil. By using this type of specimen it was hoped that a condition like that in shooting a slab in the field would be simulated, the rebound having an opportunity to fly out of the form at each end and at the top. Specimens of this size also gave less error in determining the section area. This method was not entirely satisfactory; the operator found it necessary to use more water than in ordinary field work, as is always necessary when shooting into any constricted space, and the result was low compressive strength. Also the results were not uniform due to entrained rebound, excessive rebound and unavoidable lamination. Specimens were also cored as before from samples made for this purpose.

All specimens were tested for compressive strength in a hydraulic testing machine in the laboratory of the department of engineering, and some on a testing machine of the beam type at Syracuse University. All compressive strengths shown on the accompanying curves (Figs. 3 to 5) are based on seven days' curing. Absorption tests were made in the usual manner for determining absorption of concrete.

Results of Tests—The results of the tests have been charted in Figs. 3, 4 and 5. These curves are the average of more than 500 specimens tested. They are typical curves only, and their purpose is to show general relations between the variables indicated. More experimentation and study will be necessary to fix the exact shapes of these curves, but it is believed that they are sufficiently accurate to insure in practice the best results under a given condition of sand and cement.

Before making the tests it was the belief of the engineers at Westcott Reservoir, and of other engineers so far as could be determined, that the ultimate strength

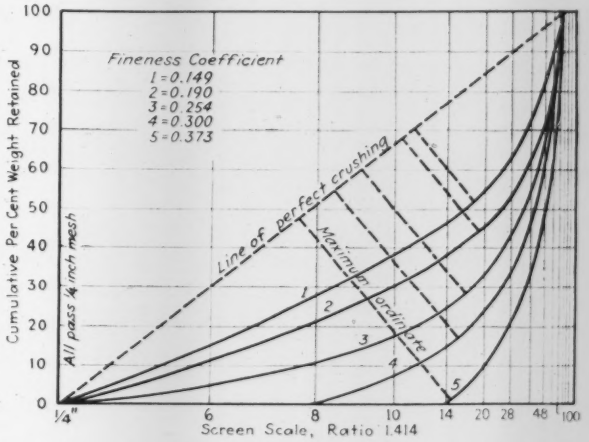


Fig. 2—Sieve analyses of sand plotted on Tyler screen scale to derive fineness coefficient

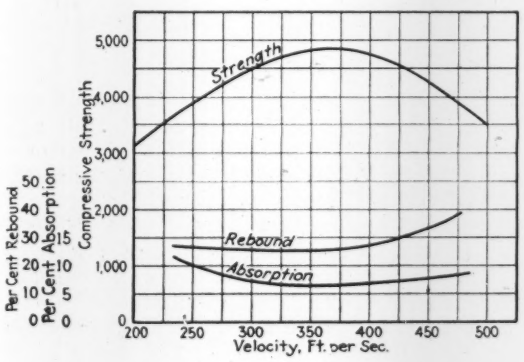


Fig. 3—Effect of nozzle velocity of cement gun in terms of strength, absorption and rebound of gunite

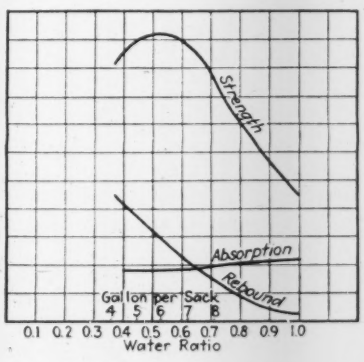


Fig. 4—Effect of water-cement ratio on strength, absorption and rebound of gunite

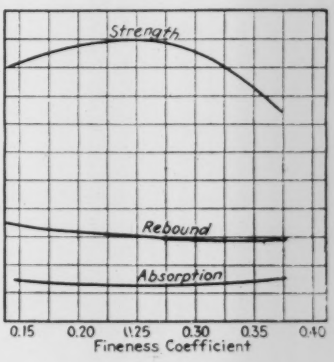


Fig. 5—Effect of fineness coefficient of sand on strength, absorption and rebound

and the absorption qualities of gunite bear a fixed relation to the nozzle velocity. It was also thought that there might be an optimum value of nozzle velocity at which the best gunite could be obtained. It was known that strength bears a fixed relation to the water-cement ratio as in concrete, but it was not definitely known what water-cement ratio should be used, or if it were more or less critical than in concrete work.

From a study of the velocity-strength curve (Fig. 3) it will be seen that there is an optimum nozzle velocity of approximately 375 ft. per second. It was expected that low strengths would result from low nozzle velocity, but very few theories were found indicating a decrease in strength for higher nozzle velocity. These experiments have consistently shown a decrease in strength for higher nozzle velocities. The absorption increased for the higher nozzle velocities, and it is nearly a minimum at the optimum velocity.

The curve of the water-cement ratio versus compressive strength (Fig. 4) has a node, as might be expected. After the maximum is passed, so little water is used that apparently the cement is not properly hydrated. As this curve is steep, it will be seen that a small variation in the water-cement ratio has considerable effect upon the strength of the gunite. It follows that to obtain the best gunite, it is necessary to shoot as dry as is practicable, the limitations being excessive rebound and sand pockets. The water-cement ratio used in these experiments is pounds of water to pounds of cement; the weight of the water in the sand is included. The rebound curve rises rapidly as the water content is diminished, as might be expected. Like the velocity-strength curve, the absorption increases as the strength decreases, or it is greatest for the greatest water-cement ratio.

The fineness coefficient versus the unit-compressive-strength curve is very similar in shape to the velocity curve. The rebound curve shows that the rebound increases as the fineness coefficient decreases. This is probably due to the larger particles of greater mass attaining more momentum and having a greater tendency to bound after impact. Fortunately, the rebound does not increase rapidly until the fineness coefficient that gives greatest strength is reached.

These experiments were carried on for the most part indoors during the winter months. When work was resumed at Westcott Reservoir in the early summer the cement guns of the contractor were equipped with velocity-measuring devices similar to the one used in the experiments.

Field Experiments

Several additional sets of specimens were shot, using the contractor's equipment and varying the nozzle velocity from 300 to 600 ft. per second. The resulting unit compressive strength substantially confirmed previous experiments. In the latter tests 3-in. thin metal tubes were successfully used for making specimens.

The contractor seemed to have a greater supply of air than before work was stopped in the fall, and a marked increase of nozzle velocity could be observed with the eye. Upon measuring these velocities they were found to average between 500 and 600 ft. per second. The air supply of the guns was then regulated so as to give a velocity of about 400 ft. per second. The contractor, engineers and other experienced men on the job agreed that this was a practical rate at which to shoot in order to produce good gunite, but most of them felt that a somewhat higher velocity was desirable. As the contractor was entitled, under the specifications, to shoot faster than 4[illegible] ft. per second, we did not press the point.

Specimens cored from the work shot at these hi[illegible] velocities did not show as great a decrease in strength [illegible] might be expected from the information obtained in t[illegible] experiments. There were conditions on the job that m[illegible] account for this apparent discrepancy. During the te[illegible] the nozzle was held at about 3 ft. from the work, but t[illegible] larger nozzles on the job were held an average of abo[illegible] 4 ft. from the work and usually at a slight angle. F[illegible] this reason a higher velocity may have been needed tha[illegible] in the tests. Also, in outdoor shooting there is usual[illegible] some wind that deflects the stream of gunite, having [illegible] tendency to decrease the effect of the velocity.

One observation on the work that checked the exper[illegible]ments was the effect of fineness coefficient. Sand be[illegible] low 0.19 produced excessive rebound and was apt t[illegible] cause bad laps and sand pockets.

Another important observation on this work was th[illegible] effect of the water content of the sand. About 4 pe[illegible]cent water content worked best. A dried sand separate[illegible] from the cement after mixing, causing a non-uniform[illegible] flow through the guns without proper mixture at th[illegible] nozzle. If the sand is too wet, guns and hose clog.

The following conclusions can be drawn:

1. The strength of gunite bears a definite relation to the nozzle velocity at which it is shot. A velocity of abou[illegible] 375 ft. per second produces the maximum strength.

2. As in concrete, the strength of gunite bears a definite relation to the water-cement ratio. In the experiments it was found that a water-cement ratio of 0.55 was as dry as it is practicable to shoot the material. A range of from 0.55 to 0.65 is recommended for the best gunite when using a similar sand. As it is difficult to measure the water-cement ratio in the field, the eye can probably be depended upon to control this variable. It was found that gunite, shot at the proper water-cement ratio, is firm to the touch immediately after placing and will quake but slightly when vibrated on the surface with the hand. It was found necessary to vary the water-cement ratio somewhat, depending upon the weather conditions.

3. The fineness coefficient bears a definite relation to the strength of gunite. For practical work the coefficient should be approximately 0.20 to 0.30.

4. It would appear that, using only a fair quality of sand, gunite shot under the above conditions should give at least 5,000 lb. per sq.in. compressive strength. Allowing for variations in the field from the ideal conditions, it would seem that 4,000 lb. per sq.in. should be fixed as the low limit to be accepted. With the best grades of sand somewhat higher values should be expected.

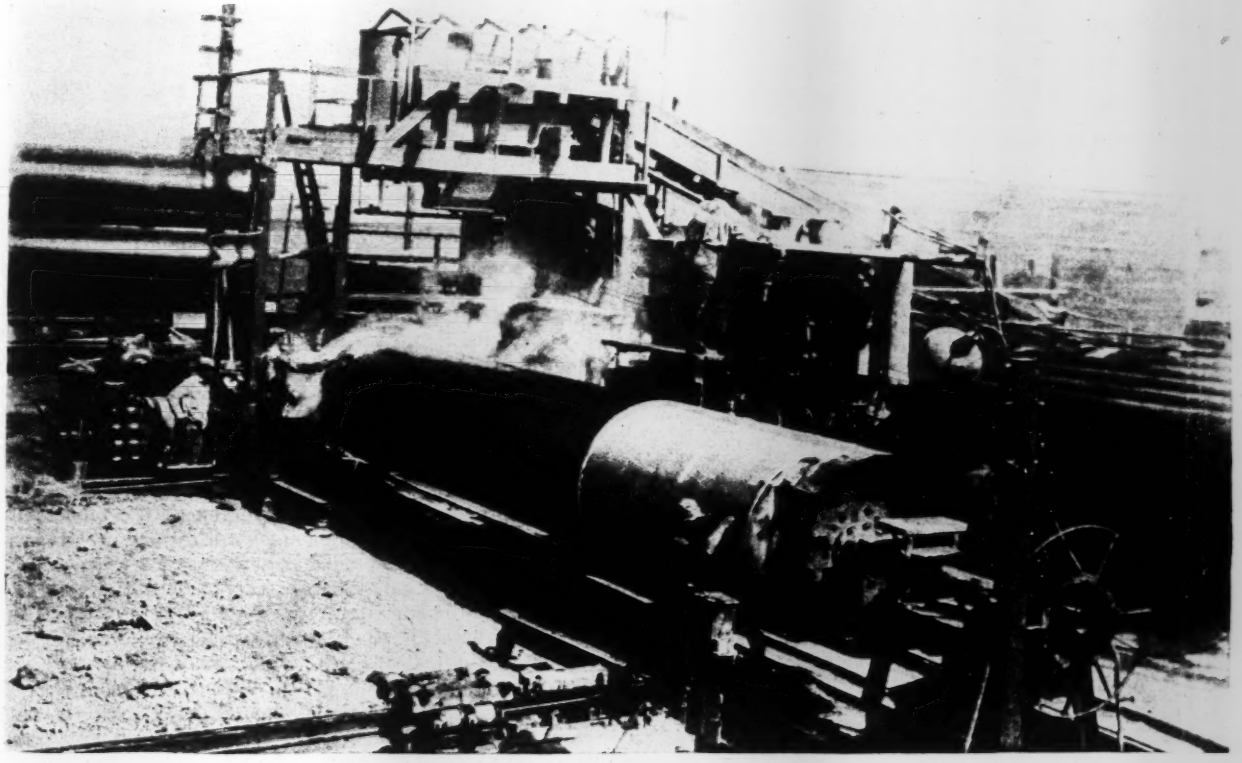
Future Investigation

There are several things in connection with guniting work that need further investigation, namely: the effect of the nozzle velocity on the production of the gun; the proper distance of the nozzle from the work; and the effect of fineness coefficient on the optimum nozzle velocity.

This work was done under the direction of William W. Cronin, acting city engineer. The design of the lining is by Marshall B. Palmer, consulting engineer for the water division. The writer was in charge of the field engineering and construction, assisted by William F. Burke, assistant engineer, and Charles E. Price, chief gunite inspector. The experiments and laboratory work were conducted by L. H. Frost, in charge of tests.

Wrapping a Cement Coating on 66-In. Steel Pipe

Newly devised machine puts protective coating on Hetch Hetchy aqueduct at rate of 1,400 lin.ft. of pipe per eight-hour shift



Wrapping reinforced cement mortar on steel pipe

Man in foreground is attaching tape for terminal band. Dollies and extension rails appear in foreground.

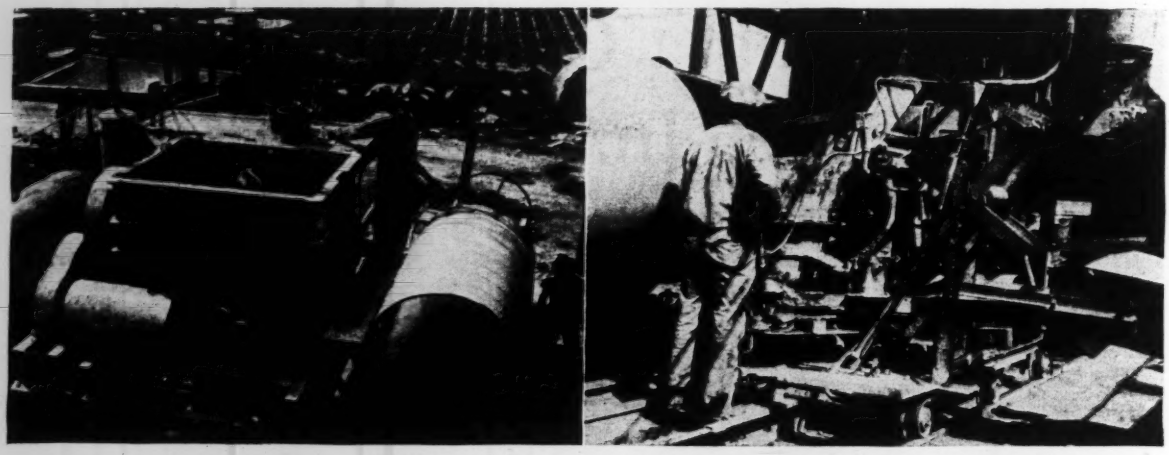
OF THE 47 miles of steel pipe line now being laid across the San Joaquin Valley in California as one of the final steps in bringing Hetch Hetchy water to San Francisco, contract was signed in May this year for about 26 miles of the line to consist of steel pipe covered with cement mortar. The part of the line to be so constructed is 56 to 66 in., and the wrapping consists of a layer of cement mortar ½ in. thick within which are included two layers of fabric, one wire mesh and the other cotton cloth.

The wrapping is being done by novel machines recently developed, the first of their kind in large size to be built expressly for this work. The first wrapping plant went into operation on Aug. 8 at Vernalis, about 12 miles south of Tracy. By the first of October that plant had wrapped some 38,300 lin.ft. of pipe, and during this time minor improvements in the equipment as well as experience in handling it had increased the rate of production so that as much as 1,400 lin.ft. of pipe could be wrapped in one eight-hour shift.

The Vernalis plant had only a single runway or curing row, and, although this was 400 ft. long, pipes of the largest size required more space if the full capacity of the machine was to be stored for 24 hours before handling. Accordingly, the second wrapping plant, at Modesto, was laid out with four parallel curing rows, each 420 ft. long, a transfer platform delivering the pipe to any row. The Modesto plant, developed from experience at Vernalis, was put in service Oct. 12 and is planned to average 2,400 lin.ft. of wrapped pipe per day of two eight-hour shifts. The following description and the accompanying illustrations relate to the Vernalis plant.

Handling of Materials—Sand is unloaded from gondola cars by a ½-yd. grab bucket delivering to a large storage bunker at track level, beside which stands an elevated 8-cu.yd. hopper served by the same grab bucket.

From the hopper the sand moves by gravity through a radial gate to a motor-driven screen of ⅜-in. mesh. Passing through the screen the sand drops into a bottom-dump car standing on rails. This car is equipped with scales for weighing the sand, and the operator who watches the scales controls the gate from the hopper. Specifications call for graded sand that contains nothing larger than ¼ in. Frequent tests of moisture content



Wrapping carriage, equipped with mortar mixer (left view) and spools of cotton and steel mesh (right view), has uniform rate of advance for pipe peripheral speed of 125 ft. per minute

are made so that measurement can be entirely by weight.

The sand car, loaded with about 20 cu.ft., is moved a few feet by hand to one end of the cement shed. Cement is delivered to the job in 94-lb. paper sacks, ten of which are dumped into each car of sand, after being passed through a screen to make sure that no foreign matter gets into the batch. The cement used is of quick-hardening rating, and the mortar shows a 24-hour strength of 4,000 lb. per sq.in.

The dry batch of sand and cement is then discharged through the hopper bottom onto an inclined conveyor belt and is elevated to a hopper above one end of the track used by the carriage of the wrapping machine. Only one batch, constituting a mixer charge, is stored in this hopper at a time, and it remains there until the mixer moves into position to receive it. Water for each batch, which is drawn from a charging tank mounted on the mixer frame, is added in the mixer after the dry batch has been turned over a few times to secure preliminary mixing.

The Wrapping Machine—Cement mortar of relatively dry consistency is wrapped around 30-ft. sections of steel pipe by a machine that slowly rotates the pipe while a carriage that puts on the wrapping moves lengthwise alongside. Mounted on top of this carriage is a 28-cu.ft. paddle-type mortar mixer, which delivers by gravity to the mechanism beneath. As the carriage moves back and forth, it is served continuously by electric power, compressed air and mixing water through flexible connections. The mixer is driven by a 30-hp. motor, and compressed air is used to secure rapid movement of the carriage in its return along the track from finishing to starting position.

When ready for wrapping, a pipe section is fastened between the two rotating heads alongside the wrapping carriage track, and the same motor that rotates the pipe sections by suitable gear reduction also advances the wrapping carriage along the track, thus assuring uniform wrapping. The advance along the track is 12 in. for every revolution of the pipe. About $\frac{5}{8}$ in. of this advance constitutes overlap in the mortar coating.

Put on in conjunction with the cement mortar are two layers of fabric, one cheesecloth and one wire mesh. Both help to support and retain the mortar while it sets. The cloth is expected to do only this and to aid in securing a smooth finish; the wire mesh, however, performs a dual service, the second function (described later) being the more important.

With the wrapping carriage in starting position, first the wire mesh and then the cloth is drawn forward from the carriage table and fastened to the pipe section that is awaiting treatment. Fastening is accomplished by a clamp that can be bolted to the pipe at any part of the circumference through the rivet holes at the end. It is to be noted that the direction of rotation is such that the bottom of the pipe section is turning away from the carriage. Skid marks on the tar coating of the steel pipe are painted over by hand with hot tar just before rotation starts.

With the fabric fastened, rotation of the pipe section is begun, and simultaneously the wrapping carriage starts its lengthwise movement along the pipe. As the fabric is unwound, cement mortar is fed down from the mixer through a hopper to the slightly inclined chute or "table," 12 in. wide, which leads to the point of application at the bottom of the rotating pipe. At the bottom of this hopper is a $\frac{1}{2}$-in. slot extending the full 12-in. width of the table. Mortar comes through this slot in a $\frac{1}{2}$-in. ribbon, and with the wire fabric it moves along the table toward the rotating pipe. Mounted on the steel sides of the hopper are two small pneumatic hammers whose tapping gives uniform delivery and density.

The wire fabric is 12 in. wide, just fitting the table width. The cloth is $12\frac{1}{2}$ in. wide. Both metal and cloth fabric are brought to the machine in rolls, and these are mounted at convenient locations so that the material can be reeled off by the tension from the rotating pipe to which the fabric is attached. The wire fabric is made of No. 25 steel wire and has a mesh of five to the inch. It is delivered in rolls of slightly more than 1,000 lin.ft.

The tension on the reel of wire fabric, which is given particular attention, determines the position of the fabric in the mortar coating and is regulated by a triple-roller device through which the fabric passes in transit from reel to pipe. Hand adjustments are provided to regulate the relative position of the rolls. In addition, tension can be increased further by hand pressure on the reel applied so as to tighten the winding.

The tension could be made great enough, at least theoretically, to pull the wire mesh entirely through the mortar and draw it tightly against the steel pipe. However, the tension required to place the wire fabric in the middle of the mortar coating has already been found by experiment, so that with careful attention the location

of the fabric is closely controlled. For the materials and conditions at Vernalis a tension of 200 lb. on the unreeling fabric produced a stress of about 10,000 lb. per sq.in. in the steel wires when wrapped around the pipe. To this stress, applied before the mortar sets, is ascribed the toughness and resiliency of the coating. No shrinkage cracks in the mortar have been found inside the wire mesh.

The cloth fabric travels immediately beneath the table and near the pipe it passes upward through a slot so as to join the ribbon of moving materials just before it is pressed against the rotating pipe surface. The cloth is thus wrapped on as an outer surface covering. In fact, it would be entirely outside the mortar if the tapping of a pneumatic hammer did not bring moist mortar through the mesh of the cloth much as a concrete paved surface is floated.

The entire table is mounted upon an axle about midway of its length, and a counterweight on the end away from the pipe causes a uniform upward pressure at the point of application. A small pneumatic hammer, mounted on the under side of the table end just beneath the line of application, taps continually as the materials are pressed upward against the rotating pipe surface. The axle mounting of the table, the uniform pressure and the pneumatic hammer combine to give a compact pipe covering with a smooth and uniform surface, regardless of any departure from a truly circular pipe section.

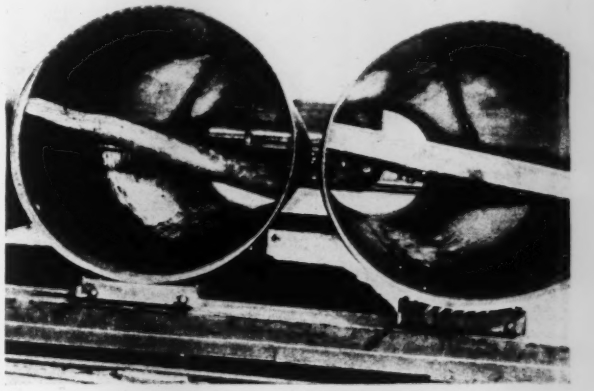
The mortar on the table is under the constant inspection of the machine operator, and, when necessary, he moistens it here or in the chute above by means of a conveniently hung small rubber hose with a thumb valve at its tip.

When the wrapping of a pipe section is completed, the fabrics are fastened at the finishing end by a clamp, and just beyond the clamp the fabric is cut with snips so as to release the wrapping carriage. The clamps used at start and finish are only temporary devices and are removed before the section leaves the machine. To make a good finish at both ends and to insure holding materials in place during setting, a few thicknesses of electrician's tape are put on at both ends while the pipe is still rotating. This tape is applied so as to form a circumferential band at the point specified for the mortar wrapping to terminate.

The tape band is formed by pressing a metal hook attached to one end of the tape into the rotating mortar surface, while the roll of tape (mounted in a reel at the prescribed point lengthwise of the pipe) unwinds as rotation continues; thus two or three layers of tape, each adhering to the layer beneath, are wrapped over the mortar. The tape-reel holder also has a cutting wheel that can be pressed against the rotating pipe. While the pipe is still rotating, hand pressure on a lever forces this wheel through the mortar and the layers of fabric, making a clean circumferential cut alongside the tape band. The adjacent fabric clamp is then loosened, and that portion of the wrapping between the tape band and the pipe end is pulled off by hand. Any mortar remaining beneath is scraped off with a hoe, the continued rotation of the pipe aiding both these processes. Specifications require that the mortar coating terminate along a line 6 in. back of rivet-hole centers. This line is the outer edge of the tape band.

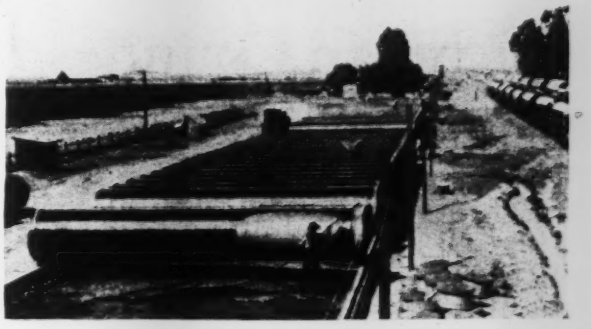
The Rotating Heads—The pipe sections are rotated by being wedged between two heads, as in a lathe, each of which is provided with a power-driven mechanism. One of the heads is equipped with a compressed-air-driven screw by which the head can be moved laterally along the pipe axis. This movement is used to force the two heads together after the pipe is delivered between them. By means of tapering wedges that enter both ends of the pipe the converging heads raise the pipe section off its rail supports.

The crew on the wrapping machine totals six men: mixer man, machine operator (foreman) and helper, tar-bucket man, and two men handling fabric clamps and tape bands. In addition to these, the steel-pipe-handling crew of two men rolls pipe sections in between the rotating heads, and the curing-row crew takes charge of the section as soon as it is set out on the rails away from the rotating heads. The application time required for coating a 30-ft. section is about 4½ min., or a peripheral speed of about 125 ft. per minute. The best eight-hour run at the Vernalis plant wrapped about 1,400 lin.ft. of pipe.



Finished sections in the curing row

Dollies make it possible to move sections without rotation.



The curing row, 400 ft. long

At the far end the pipe sections are loaded onto motor trucks.

After the wrapping is completed, the pipe is not rotated until after the curing period. Instead, it is moved on small dollies, one of which is placed under each end of the pipe, designed to roll along the rails in the curing yard. When a pipe section is to be removed from the revolving head, extension rails are swung into place under the pipe, the dollies are placed upon them and the revolving heads are backed off, lowering the completed pipe to the dolly supports.

The dollies were specially made for this purpose; each one has two double-flanged wheels set in a piece of steel plate bent into the form of a channel iron, with

short lengths of angle iron on top to keep the pipe section from rolling off. These dollies run on strap-iron rails set on top of timber stringers in the curing yard. Spacers made of 2x4's are laid on the rails between the dollies, so as to prevent the adjacent pipe from colliding in any movement that may be made during the curing process.

When a pipe section is lowered from the rotating heads onto the dolly supports, care is taken to place the two longitudinal seams at top and bottom. This is done because it has been found that when the sections are in this position less bulging and deformation from true circular section results. This is particularly important in handling the pipe made of the lesser metal thicknesses. As a further aid in maintaining a true circular section during the curing process, timber struts are wedged into both ends of the pipe at right angles to a diameter connecting the two longitudinal seams.

In lieu of some system for keeping the pipe wet during curing, which would have been expensive on this job, immediately after being removed from the wrapping machine the pipe is given an asphalt oil coating as an aid to effective curing, and the pipe section is then moved to its place in the curing row. Movement of pipe sections along the curing row is effected by power-operated cables attached to the dollies. After the 24-hour curing period the dollies are dispensed with, the sections being then rolled along on a timber skidw As soon as the dollies are freed, they are returned the wrapping machine.

At the outer end of the curing row a crane picks the pipe section and places it on a motor truck delivery to the trench. A similar crane on a truck moves along the trench lifts each section as it arriv alongside the trench and lowers it carefully to pla

In the trench the joints between pipe sections riveted, and the 1-ft. length of exposed metal at e joint is covered by casting a collar around this porti sufficiently thick to insure at least ½ in. of mortar outs any part of the pipe. This is facilitated by the holes excavated in the trench at each joint.

All work on the Hetch Hetchy aqueduct is bei done under the direction of M. M. O'Shaughnes Contract for wrapping the steel pipe is held by t Cement Wrapped Pipe Co., Ltd., organized by W. Kraner, who devised and patented the wrapping m chine. The pipe is being fabricated by the Weste Pipe & Steel Co. and is delivered from the wrappi yard to the trench by the R. C. Conyes Co. The for of the Cement Wrapped Pipe Co. at the plant includ W. F. Fosha, assistant designing engineer, C. J. Larse general superintendent, and S. C. Pierce, concrete tec nician. Pat Kernan is inspector for the San Francis city engineer.

Field Observations on Highway Practices

Michigan Counties Absorb Township Roads

About 60,000 miles of township roads will be taken over in five years and their maintenance aided by state money

By C. S. HILL
Associate Editor, Engineering News-Record

THE ABSORPTION of all township roads into the county road system is provided for by an act of the last Michigan legislature. This act was conceived and passed as a tax-relief measure and it is named the township-relief road bill. It orders the counties to take over gradually the township roads and provides state aid for their maintenance and a measure of state supervision over the expenditures of state money. State aid begins in 1932, when the first 20 per cent (about 12,000 miles) of township roads is to be taken into the county system. State, county and township highway officials are now occupied with the preliminary tasks of financing and transfer.

The total road mileage of Michigan is about 85,000. This is divided into about 8,000 miles of state roads, 17,000 miles of county roads and 60,000 miles of township roads. Previously these systems have been financed and directed independently with interlocking administrative relationship where joint financing was involved. Under the new law the township will cease to exist as an agency for highway administration, and the counties will direct all highway affairs other than those of the state system, except for control checks by the state highway department on the expenditure of state-aid mone The new act provides first for a census of townshi road mileage, as of Jan. 1, 1931, by the state highwa commissioner. This count fixes the road mileage o which state aid is apportioned and is separate for eac township and county. The count does not include street and alleys in recorded plats unless they were townshi roads prior to recording the plats.

With the township road mileages certified, the ac orders each county, prior to April 1, 1932, to take ove 20 per cent of the roads in each township of the county Each year thereafter on the same date the county wil take over an additional 20 per cent until all townshi roads are absorbed in the county system. In the yea next following all dedicated streets and alleys in recorde plats, outside of incorporated cities and villages, will b taken over and become county roads. In selecting eac year's 20 per cent of roads the preference is to be give to post roads and main traveled roads, but all roads ar to be contiguous to, and connecting with, existing county or state roads or city streets. Each year's mileage taken over will also require approval and confirmation by th state high commissioner.

To finance the added county mileage as it accrues, th counties will receive from the state highway funds, each in proportion to its township highway mileage $2,000,000 in 1932, and each year afterward an addi tional $500,000, until in 1936 the annuity reaches $4,000,000, at which amount it thereafter remains. This money is to be used primarily for maintenance, and after proper maintenance any remaining money may b

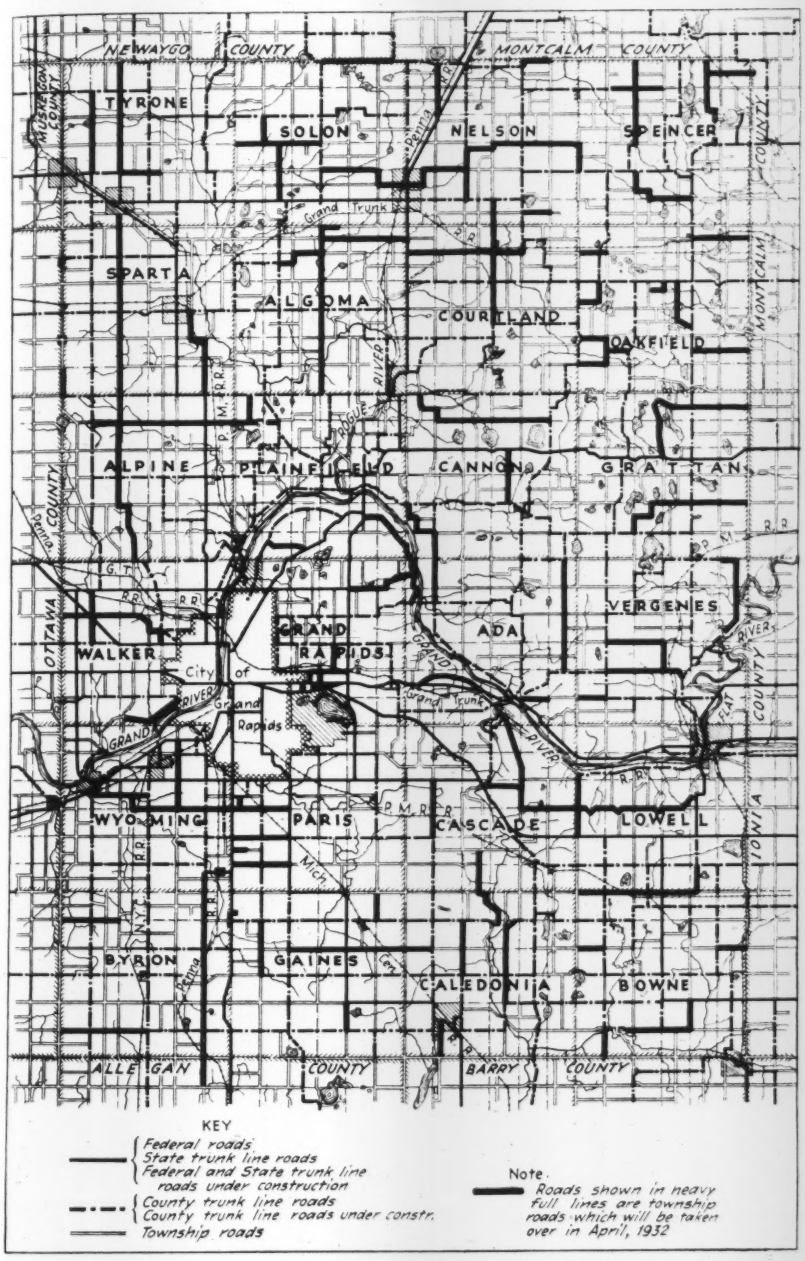


Fig. 1—County road map showing township roads to be taken over in 1932

used for construction. Any further money for construction may be raised by limited township tax levees not exceeding 5 mills in 1932, 4 mills in 1933 and 3 mills in 1934 and the years thereafter, except when necessary to meet obligations incurred prior to the act. When all township roads become absorbed in the county system, financing in addition to state aid becomes a county obligation.

The act provides state control over state-aid expenditures by requiring that each year counties shall report to the state highway commissioner all their appropriations "upon such form, in such manner and at such time" as he shall prescribe. The commissioner can deny further aid until the reports are in "satisfactory form."

Fundamentally the new act is a highway maintenance law. The counties take over township roads for maintenance aided by state funds. Only in the eventuality that state-aid money exceeds the cost of maintenance can any of it be used for construction. The maximum of $4,000,000 state aid for 60,000 miles of road allows an expenditure annually of less than $66 a mile. Improvement of this mileage, even within the definition of improvement given in the law (which is "reasonable condition for public travel, including width of grade, drainage, drainage structures and surface as will permit of reasonably economical maintenance"), will still require local financing.

The direct authority of the state in the conduct of work with state money is nominally small. Indirectly, through good relations of the state highway officials with those of the counties, considerable influence can be exercised. A positive aid to the success of cooperative work exists in the generally high character and efficiency of Michigan county highway organizations. Generally they have been working in harmony with the state highway department, and it is reasonable to expect these relations to continue.

A definite promise of gain exists in the transfer of the planning and execution of upkeep and improvements on township roads to county organizations employing capable engineers and possessing modern equipment.

Funds for state-system improvement will be curtailed. Combined with legislation a year ago requiring the state to finance improvements in cities of state routes, the new law materially reduces the funds for state-road improvement in the rural sections—the roads that chiefly serve the heavy and profitable vacation and tourist travel.

Tax relief for township road maintenance is evident, but it will accrue only on the roads progressively absorbed by the counties over a period of five years. The roads until taken over remain a township responsibility, only the road tax rate may not exceed that named in the law. If at any time roads are taken over, improvement is undertaken for "reasonably economical maintenance," the township shares expense with the county; after all the roads become county roads the expense is spread over the county, and the townships each pay a share.

Transfer Procedure

The preliminary task of counting township road mileage is well advanced. The counties and townships are making the count, and the state highway department is checking and computing the returns. Working through the counties, the state highway department provided for each township triplicate certificates and a map to scale, on

which the township authorities marked in color the location of the township roads. One certificate was retained by the township, and the others were returned to the county, which retained one and forwarded the other with the map to the state highway department. At the same time the county forwarded a county-road-system map.

At the state highway department the mileages returned by the townships are checked by scaling the maps, and if material discrepancies are disclosed, they are traced back with the county and township and proper correction is made. A frequent experience of townships, when they came to check their roads, was to find that supposed mileages were greatly in error. When finally checked and approved by the state, the mileages become the official figures on which state aid is apportioned.

The selection of roads taken over each year by the counties must by the law have the approval of the state highway commissioner. The counties will be required then to present maps showing the location, type and nature of improvements of all township roads in the county as well as the roads that are to be taken over. The roads will be classed on these maps as earth, gravel, macadam and paved. To meet this requirement and also for the organization of their own activities, the counties have a large amount of careful work to perform.

Example of County Procedure

Most counties have not yet proceeded much beyond the census of township mileage. To indicate the possible task, therefore, selection has been made for illustration of one county that has gone well ahead in its plans. Kent County, in which the city of Grand Rapids is situated, is selected. Its first step was a complete fact-finding survey of the roads in each township. The instructions for this survey were as follows:

The purpose of this survey is to obtain such information about the township roads as may be of assistance in proceeding under the new law, which procedure may be divided into three parts: (1) taking over 20 per cent of mileage each year; (2) maintaining roads taken over; and (3) reconstruction.

The information to be obtained for the above purpose shall be as follows:

1. Classification of roads according to condition of grade and surfacing.
2. Location, size, type and condition of bridges and culverts larger than 36 in. in diameter.
3. Location of all houses, schools, consolidated schools, churches, town halls and grange halls.
4. Roads that are used for rural mail routes and consolidated school-bus routes.

This information shall be arranged as follows:

1. Twenty-four township maps showing the six types of buildings in black and the six different road classifications in colors.
2. One large-size county map, same as above.
3. Twenty-four township maps showing bridges numbered and in two colors: (1) those whose clear span is 15 ft. and more; and (2) those whose span is less than 15 ft. but larger than a 36-in.-diameter pipe.
4. Card-index system with a card for each bridge, numbered according to the maps and giving detailed information about the structure and its condition.
5. One large county map showing the rural mail routes and the school-bus routes in two colors.

The following is a more detailed explanation of the information to be obtained by this survey:

1. Road classification shall be divided into six parts, class *A*, *B*, *C*, *D*, *E*, *F*, as follows:

A All roads whose grade width is 18 ft. or more and which are good enough to be taken over and maintained without any work being done on them. Need scraping only.

B Like *A*, but needing some repairs to grade or surfacing.

C All roads that have enough gravel on a proper alignment to warrant contract for rebuilding and widening.

D Earth roads that have been graded or turnpiked; little or no gravel.

E Ungraded earth roads in common use.

F All other township roads; little or no use. Get reasons non-use.

The following color scheme is recommended for maps show the road classification:

A	Red	*D*	Bro
B	Green	*E*	Pur
C	Yellow	*F*	Bl

The symbols showing in Fig. 2 are recommended for show buildings in black. The locations of these buildings are to obtained by speedometer measurements.

Information on bridges and culverts shall consist of the lowing: (1) location by speedometer measurement; (2) size waterway—clear span and height; (3) clear width of roadwa (4) alignment with present road; good, fair, poor; (5) type abutments and conditions; (6) type of superstructure and c dition with some information as to strength, such as size beams and floor, if possible; and (7) suggested repairs if nee in near future.

The map is to show bridge location in one of two colors, r

Fig. 2—Road map of Tyrone township in Kent County

for 15-ft. span and larger; green, smaller than 15-ft. span. The card index is to give detailed information about size, type and condition; map numbers and card numbers to correspond. The structures are to be numbered consecutively in each township, the number to be preceded by the necessary first letters of the name of the township, such as Spe-27 for Spencer township, and Spa-14 for Sparta township, and G.R.-43 for Grand Rapids township.

Mail routes and school-bus routes are to be mapped as noted above in two colors without any reference to the route number, but merely to show the road over which it passes. In case the two overlap, both colors are to be shown. Suggested colors are: red for mail routes and green for bus routes.

The county engineer, Otto S. Hess, now estimates that 600 to 700 miles are in the third classification (*C* above) and that 800 of the 1,200 miles to be taken over are either in good condition now or can be put in good condition at a cost of from $2,000 to $3,000 a mile. In considering the condition of the roads as classified above it should be remembered that Kent County is highly developed and progressive in road improvement. Many Michigan counties will not show such highway conditions. Kent County will take over about 240 miles on April 2, 1932, and will receive about $40,000 state aid.

Information on which this article is based was obtained by personal study and from information furnished by state highway department engineers, the engineers of Kent County and the Portland Cement Association.

Low Streamflows Again Cause Concern in Southeastern States

Groundwater reserves are depleted below all previous records—Lack of rainfall adds to the shortage in runoff—Municipal water supplies are benefiting by experience gained in the 1925 drought period

RECORD low streamflows over a wide area in the Southeastern states have affected seriously all power developments and are rapidly becoming hazardous to many municipal and industrial water supplies. Accumulated rainfall deficiencies from November, 1929, to date are greater than for any other similar period of record. Ample showers during the past summer produced good crops, but there have been few long soaking rains for two years. As a result, groundwater reserves are more depleted than ever before.

Headwater areas of the principal streams of the Southeast appear to be most seriously affected by the current rainfall deficiency. From central West Virginia south through the mountain and foothill sections of Virginia, Tennessee, the Carolinas, Georgia and Alabama the reduction in precipitation below the normal is extremely great for the last two years. For example, it amounts to nearly 33 in. at Atlanta, while the average annual rainfall is about 49 in. there.

In certain isolated sections of the mountain areas of Georgia and North Carolina where the average annual rainfall runs from 60 to 80 in. the deficiencies appear to be even greater. On the headwaters of the Catawba in North Carolina the deficiency of the first ten months of 1931 was about 20 in., with no rain since the end of October. Hence, the reduction from the normal seems likely to be nearly 40 in. for the two-year period.

Engineers in the affected territory began last spring to call attention to the certainty of low streamflows this fall. In a bulletin issued last July Thorndike Saville, chief engineer of the North Carolina department of conservation and development, urged those in charge of power projects and municipal supplies to anticipate a "streamflow" drought this fall, even though rainfall during the summer was unusually heavy. As a matter of fact the rainfall at Charlotte in that state in July and August this year exceeded the normal by nearly 6.5 in., and still the streams in that section are now at record lows.

The Yadkin, one of the two largest streams in North Carolina, the week of No. 8, dropped below the previous minimum flow of 800 sec.-ft. Present prospects are that this flow will go much lower, since the groundwater reserves of the watershed of this stream in the mountains are practically gone. The large power developments of the Aluminum Company of America and the Carolina Power & Light Co. on this river are feeling the effect of this decrease in water.

Almost complete utilization of the flow and fall of the Catawba River in the Carolinas by the several hydro plants of the Duke Power Co. makes it difficult to determine just what the net current flow of that stream is. During October that company held its own in its reservoirs, although drawing on them for a smaller percentage of its total power requirements in that month than in October, 1930. On the other hand, the company for several weeks has been operating 76 per cent of its total steam plant reserves. Thorndike Saville also reports that the flow of the Catawba in its upper reaches at the end of October had not quite dropped to the minimum established in 1925. But there has been no rain on the watershed since then, so the all-time minimum is likely now to have been reached and passed.

From available data it appears that for the two-year period the Saluda River in South Carolina is as badly affected as any of the streams on the east slope of the mountains. The minimum flow of record for that stream for a full year is 49 billion cubic feet. To date this year the flow has been less than 42 billion cubic feet, with every prospect that 43 billion will not be reached during 1931. As a result, the reservoir at Saluda dam is very low and is being drawn down constantly.

In the adjacent Broad River, which enters the Saluda at Columbia, the Broad River Power Co. is able to get only 5,000 kw. from an installed capacity of 23,000 kw. in hydro plants. That company is operating its steam plants to capacity.

In north Georgia the upper reaches of all streams have already established all-time low flow records. The great Burton reservoir of the Georgia Power Co. contains less than 10 per cent of its total capacity. The Chattahoochie River in Georgia has not yet quite reached its minimum flow of record but it will likely do so soon. The large plants of the Georgia Power Co. on that stream are operating at greatly reduced rates. The Georgia Power Co. also has all of its steam plants in service, but with some reserve capacity.

Conditions in Alabama are just about as bad. The immense reservoir created by the Martin dam of the Alabama Power Co. on the Coosa River is down to a storage of less than 10 per cent of capacity. Reports state that that company is using nearly 80 per cent of its steam plant capacity.

On the west side of the mountains in the affected states the conditions are similar to those on the east slope. The Freach Broad River at the end of October was 38 per cent below normal discharge and very close to the record minimum. Since then it is probable that this stream has made an all-time minimum runoff record.

Exact figures for other streams in the western part of North Carolina on which large power projects are located are not obtainable, except in the case of the Pigeon River. At the 100,000-kw. plant of the Carolina Power & Light Co. on that river the flow reached and dropped below the minimum record of 100 sec.-ft. the week of Nov. 8. While the hydro plant of the Carolina Power & Light Co. at that point and the other hydro plants of that company are operating at reduced outputs, none of the steam reserves of the company are on the line, due to the obtaining of power from tie-in lines.

Reports state that the Tennessee River at Chattanooga is just about at the minimum stage established during the 1925 drought. Tennessee Electric Power Co. is operating its steam plants, but has considerable reserve capacity. On account of the low stages of the streams that form the Tennessee River, it is likely that that stream will soon reach a stage well below the all-time minimum record.

Steps taken following the extreme low streamflows of 1925 and 1926 in the southeast to augment municipal and industrial supplies have thus far forestalled much distress from the present water shortage.

In the swamp country along the coast extensive areas that are usually wet, have dried out entirely. Brush and forest fires are becoming common.

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

Interior of a Stressed Body

REVIEWED BY C. J. TILDEN
Professor of Engineering Mechanics, Yale University, New Haven, Conn.

PLASTICITY: A Mechanics of the Plastic State of Matter—By A. Nádai, Dr. Eng., M.Am.Soc.M.E., Research Laboratories of the Westinghouse Electric & Mfg. Co.; Member Faculty of Graduate School, University of Pittsburgh; formerly Professor of Applied Mechanics at the University of Göttingen, Germany; Assisted by A. M. Wahl, M.S., M.Am.Soc.M.E., Research Laboratories of the Westinghouse Electric & Mfg. Co. [No. 1 of Engineering Societies Monographs]. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 349; many illustrations. $5.

DR. NÁDAI has written a book on a phase of the subject of strength of materials to which comparatively little attention has been paid by engineers generally. He points out in the preface, however, some of the practical applications of the various questions of plasticity which he discusses in detail. The large amount of energy consumed in rolling mills, problems of forging various metals at high temperatures, limiting conditions of stress at which permanent set begins and the possible change in shape of machine parts exposed to long duration of stressing make considerations of the plastic state of particular interest in the engineering field.

The book is divided into two parts. The first part, in which the author discusses the plastic state of matter with special reference to metals and mechanics of engineering problems, is presented in 30 chapters, totaling 288 pages. The second part, of only six chapters, discusses some of the applications of the mechanics of the plastic state of matter to geology and geophysics.

For the first part a mention of some of the chapter topics will indicate the scope of the discussion: solid and fluid states, plasticity and viscosity, behavior under high pressure, effects of time and changing temperature, elastic and permanent deformation, stress and strain, old and new theories relating to the conditions causing failure. The book up to this point (the first fifteen chapters) is largely theoretical, tying up the discussion of the plastic state with the derivations, familiar to engineers, based on the elastic theory, or at least on stress conditions within the elastic limit. The engineer's habit of speaking of his materials of construction as *ductile* or *brittle* is commented on, and the suggestion is made that "it is more correct to speak, not of brittle or ductile materials, but rather of the brittle or the plastic state of these materials." Following are chapters on strain or flow figures, compression, plastic torsion and the effect of holes or grooves. In the discussions abundant use is made of reproduction of photographs of the visual effects of distortion beyond the elastic limit. Many of these tests are made on paraffin prisms or cylinders, and the photographs show the strain figures in a most illuminating and suggestive manner. Equally interesting are the photographs of the same kind of flow lines ("Lüders' lines") on prisms, cylinders, etc., of polished steel. The discussion of plastic torsion and the pictures of examples of the plastic stress function for torsion as represented by wooden models deserve particular mention.

The question of the bending of bars is next taken up, including the theory of bending when the deformations do not obey Hooke's law; the pure bending of a bar with rectangular cross-section; plastic bending and the effect of "work-hardening" on plastic bending—that is, taking into account the increase in yield stresses which occurs for most ductile metals with increase in strain. Buckling, the hollow cylinder, rotating disks and cylinders, the theoretical and practical discussion of a plastic mass pressed between plates, and other cases of plastic flow are also discussed.

The chapter on hardness describes the various tests in use, followed by some observations as to plastic deformation which are illustrated by eight or ten half-tone views of steel, copper and paraffin indented by cylinders and hardened balls. These are particularly good. The remaining chapters of Part I discuss the problem of contact of elastic bodies with the results of certain photo-electric contact tests, inherent and residual stresses (discussed mathematically), and finally elasticity and plasticity at elevated temperatures, bringing in again the subject of "work-hardening," the influence of the speed of deformation, and the stress-strain-velocity diagram. Two excellent examples of the latter are shown.

In the second part of the book the author goes into a field most interesting in itself but rather far removed from the realm of the practicing engineer—a discussion of the application of the mechanics of the plastic state of matter to geology and geophysics. One brief chapter is entitled "Mountain Building" and another "The Weight of the Continents." The final chapter is concerned with traces of motion that may be found in the structure of rocks.

The volume is the first of the Engineering Societies Monographs and contains a brief notice of the arrangement inaugurated by the four national engineering societies—Civil, Mining, Mechanical and Electrical—"for the production of selected books adjudged to possess usefulness for engineers or industry but not likely to be published commercially because of too limited sale without special introduction." This activity of the four societies is under the direction of the Engineering Societies Monographs committee, composed of two members each from the four societies above mentioned, under the chairmanship of Harrison W. Craver, the director of the Engineering Societies Library. The inauguration of such an activity on the part of these societies deserves special mention and commendation. A series established on such a basis and under such auspices will be certain to bring out valuable contributions to engineering and scientific literature. It would seem also that the choice of the book under review is a particularly happy one for the inaugural. Dr. Nádai's book is a scientific and scholarly piece of work. By no means the least part of its value is the broader conception that it gives of what goes on within the interior of a stressed body. Although this part of the designing engineer's activity is of vital importance in structural and machine work of all kinds, it has to be based on imagination and theory. Any discussion that tends to illuminate and direct the engineer's constructive imagination is of great value. Such a discussion, clearly and ably presented, is offered to a marked degree in this book.

Witchcraft, Metaphysics and Engineering

REVIEWED BY ABEL WOLMAN

Chief Engineer, Maryland Department of Health; Editor, Journal American Water Works Association, Baltimore, Md.

THE MODERN DOWSER: A Guide to the Use of the Divining Rod and Pendulum—By Le Vicomte Henry de France. London: G. Bell & Sons, Ltd. Cloth; 5x8 in.; pp. 135; halftones and line cuts. 3s. 6d. net.

HANDBUCH DER WÜNSCHELRUTE: Geschichte, Wissenschaft Anwendung—Von Graf Carl von Klinckowstroem und Rudolf Freiherr von Maltzahn. Munich: R. Oldenbourg. Linen; 6x9 in.; pp. 321; many halftones and line cuts. 18 marks, or 16 marks in paper covers.

ARCHIV ZUR KLÄRUNG DER WÜNSCHELRUTENFRAGE: Organ des Verbandes zur Klärung der Wünschelrutenfrage E. V.—Herausgegeben von Carl Graf von Klinckowstroem, Rudolf Freiherr von Maltzahn, Stadtbaurat Dr.-Ing. Edwin Marquardt. Vol. I., No. 1, July, 1931. Munich: R. Oldenbourg. Paper; 7x10 in.; pp. 72. 4 marks for two issues per year; single copies, 2.5 marks.

ENGINEERS as a rule shy away from the occult and the mystical, but almost every practitioner in engineering has at one time or another been confronted with the claims of the "water witch," the "dowser" and the "diviner." The literature on the amazing performances of the man, woman or child with the forked twig, the divining rod or the pendulum dates back earlier than the Middle Ages. Even an incomplete bibliography on the subject includes well over 300 references. The subject has been reviewed in almost every country in the world; controversy still rages on the merits of "divining"; new applications of the powers of dowsers come apace each day; societies of divining rod practitioners increase in numbers, and publications, ponderous in bulk and unimpressive in conviction, flow from the press.

The U. S. Geological Survey, in Water Supply Paper No. 416, published an excellent monograph on "The Divining Rod: A History of Water Witching" in 1917, by Arthur J. Ellis. In 1926 a more comprehensive volume appeared in London, entitled "The Divining Rod: An Experimental and Psychological Investigation," by Sir William Barrett and Theodore Besterman. These authors apparently covered the literature thoroughly, with the interesting but turgid conclusion that "the dowser, in our opinion, is a person endowed with a subconscious, supernormal, cognitive faculty, which, its nature being unknown, we call, after Prof. Richet, cryptesthesia." This conclusion, however, has the great conservatism of the Britisher in contrast with the finding of our own American engineer, Raymond, one of the admirers of another American "believer" and engineer, Charles Latimer ("The Divining Rod," 1876), who concludes: "To this, then, the rod of Moses, of Jacob, of Mercury, of Circe . . . even of Mr. Latimer has come at last." (American Institute of Mining Engineers, Vol. 2, pp. 411-446, 1883).

To this already abundant library the three volumes now under review are fascinating additions. The first and smallest of these three is a translation from the French of a guide to the use of the divining rod and the pendulum entitled "The Modern Dowser." The Vicomte Henry de France comes from an old French aristocratic family and his qualifications for the onerous task result either on account of his having been licentiate in history and geography at the University of Paris or because he was at one time president of the Casting Club of France. The reviewer has a sneaking suspicion it is the latter. But, besides, he is now, among other things, president of an international union of dowsers.

de France's imagination has no limit. Aside from commenting upon the history of the rod and the pendulum, he presents simple rules for their use and application to the discovery of subterranean water, rocks, ores, minerals and metals and to investigations in biology and medicine. The translator extends these flights by pointing out that "farmers, architects, archeologists, engineers, officers, geologists, doctors, veterinary surgeons, all have a use for it." It was probably purely an oversight that he failed to include economists, who could certainly use such a universal aid to accuracy of prediction.

The book gives numerous examples of the application of the divining rod to the discovery of criminals (p. 4), the pick-up of the path of a hunted animal (p. 7), water analysis (p. 15), diagnosis of cancer of the breast (p. 16), petrographic analysis (p. 19), potability of water (p. 64), petroleum, wines and various liquors (p. 68), ad infinitum.

The German text by Klinckowstroem and Maltzahn, "Handbuch der Wünschelrute," in characteristic Teutonic fashion traverses the same ground at much greater length and with less naivété. It, too, traces the subject from the standpoints of mythology and folklore, physiology, psychology, physics and application. The book is a strange and voluminous mixture of pertinent and extraneous science, history and bosh. Some of the chapters on mythology and the history of the search for water are fascinating and well worth the price of the book. Others on physiology, psychology and physics appear to be accurate but have little to do with the divining rod. They might well appear in any other text. The chapters on application are long, pseudo-scientific conglomerates of fact and fancy—all interesting and confusing. The bibliography is comprehensive and valuable.

To complete the story for the time being, the reviewer must comment briefly on the third volume listed. It is the first number of the official organ of the Society for the Clarification of the Divining Rod Problem. Its editors are Klinckowstroem and Maltzahn, the authors of the book noted above, and Erwin Marquardt. This organization has already issued twelve monographs, but it had the urge to publish more often and more regularly. Hence the "Proceedings"! The first issue continues the song and dance on the divining rod question in geology, water supply and stream control. Maltzahn and Marquardt contribute a polemic in reply to an attack on the efficacy of the divining rod by one Prof. Zunker. Future issues will cover the application of the divining rod to "physics, physiology, psychology, water supply, foundations, geology, technology, hydrology, geophysics, climatology, therapeutics, etc." At least, the coming winter will be full!

Life Characteristics of Physical Property

REVIEWED BY JOHN H. GREGORY

Consulting Engineer, Professor of Civil and Sanitary Engineering, Johns Hopkins University, Baltimore, Md.

LIFE CHARACTERISTICS OF PHYSICAL PROPERTY—By Robley Winfrey, Bulletin Editor, Iowa Engineering Experiment Station, and Edwin B. Kurtz, Professor and Head, Electrical Engineering Department, State University of Iowa. Bulletin 103, Iowa Engineering Experiment Station, Ames, Iowa: Iowa State College. Paper; 6x9 in.; pp. 143; tables and line cuts.

IN THE bulletin named above the authors present a method of calculating the mortality curve and the rate of renewals of particular examples and types of physical equipment. The method has been applied to 65 sets of original life data for property found in the following

industries: water supply, telephone, telegraph, electric service, electric railway, steam railroad, agricultural implement, and motor vehicle. The mortality studies of physical property were begun by Prof. Kurtz in 1916, and since 1922 have been continued by the authors for the Iowa Engineering Experiment Station. For engineers interested in the life characteristics of physical property the bulletin is an interesting one. A book entitled "Life Expectancy of Physical Property," by Prof. Kurtz, was reviewed by the present writer in *Engineering News-Record*, Nov. 20, 1930, p. 815.

Underpinning Design and Construction

UNDERPINNING: Its Practice and Applications—By Edmund Astley Prentis and Lazarus White. New York: Columbia University Press. Cloth; 6x9 in.; pp. 318. $7.50.

REVIEWED BY T. KENNARD THOMSON
Consulting Engineer, New York City

ANYONE interested in either underpinning or foundation work, be he engineer, contractor or property owner, should read the new book on these subjects by Prentis and White. The character of the book is partly due to the fact that the authors are engineers who have become contractors, for this double range of experience gives them a specially broad insight into the subject.

Many years ago an old-time contractor, a very fine one, said to me, probably half seriously, that *"engineers could not make good contractors."* My answer was that while I was not a typist I could type a letter; although first efforts would be crude and take considerable time, if I devoted sufficient time and practice I would eventually become proficient. On the same principle an able engineer would probably be a poor contractor until he had gone into contracting and learned the business by hard practical experience. But after such experience a trained engineer with business ability would have a great advantage over a contractor who is not an engineer. "Underpinning" and the record of the authors' firm (Spencer, White & Prentis) more than confirms this expectation, for no ordinary contractor could of himself have written such a book, nor could he have designed and carried out the work they have done and discuss in the book.

Foundations, including underpinning, are more a question of personal experience and judgment than any other branch of engineering. Each site presents a problem of its own, and the engineer always faces the task of giving his client the best solution that he is willing to pay for. The problem is simplest, of course, where rock is within reach, for in this case a building can be underpinned without *any* settlement; but even here it might sometimes cost less to put up a new building.

Recognizing these conditions, the authors state (p. 28) that "the design of underpinning is not an exact science." Right! Beautiful pressure curves may be drawn on paper, but they do not exist underground, and when subsoil materials are taken into the laboratory for testing they are no longer subsoil materials, any more than pulverized coal can compare with coal in its natural bed as a foundation material. Therefore the reader must not rely as fully on the reasoning presented in Chapter VI as on the experiences given in the rest of the book. The personal opinion of the authors on a particular job would doubtless be much more valuable than this reasoning as another man might interpret and apply it.

In every part of the subject seemingly minor details should have the reader's careful attention. This is particularly true of the brief statement (p.19) in which the authors advise bracing against lateral movement, a very important precaution of common sense. Its neglect in a recent case had very serious consequences, running into hundreds of thousands of dollars, where a building moved, settled and was condemned.

It is a pleasure to see the authors give credit to the patents of Breuchaud & Goldsborough, 1896-97, then of the firm of McMullen & Breuchaud; to that dean of engineers, the late Alfred Noble, and to others. Recollections of the reviewer's early work were awakened by the illustrations on pp. 195 and 196, which represent one of the pioneer cases of modern underpinning. The illustrations are from my original drawings.

On this job the contractors were assured by the owners of the Western Union Building, on Broad St., and the Stock Exchange, then on New St. only, that their buildings were "supported by piles, all driven to rock," so the owner had been told. The first caisson to be started by McMullen & Breuchaud was placed next to the Western Union, and before it had gone down 10 ft. it was found that it would be necessary to cut off the upper one-third of the piles because they were battered and encroached. Work was at once stopped and the Western Union and Stock Exchange considered it advisable to pay the contractors to underpin their buildings. This was the first instance of the use of pneumatic caisson cylinders for underpinning. A glance at p. 196 of "Underpinning" will show that the piles stopped 20 ft. above rock.

Settlement in underpinning, which the authors in all their recommendations aim to avoid, also recalls the job just mentioned. Then, as well as many times since, we have driven wedges on top of the cylinders, making any settlement impossible, whereas now many leave out the wedges and expect a half inch or so settlement—which they get sometimes with very serious results.

The New York building laws, as quoted by the authors, allow 40 tons per square foot on hard rock, and double or more than that on a 14-in. pipe, which may stop in sand and may be all right as long as the friction is not disturbed. The pipe is rarely as safe a support as the square foot of rock.

To do full justice to this important book would require a review many pages long. But it will suffice for the present occasion to repeat the opening statement that the work should be studied by every engineer, contractor or property owner who has to do with underpinning.

Rupture Under High Pressure

THE PHYSICS OF HIGH PRESSURE—By P. W. Bridgman, Ph.D. Professor of Physics, Harvard University. [International Text-Books of Exact Science.] New York: The Macmillan Company. Cloth; 6x9 in.; pp. 398; line cuts and tables. $5.50.

HOW materials behave at pressures of thousands of atmospheres—even 20 to 30 thousand—is of little present concern to civil engineers. Bridgman's "Physics of High Pressure" contains one chapter, however, that needs to become familiar to all students of the strength of materials, the chapter on special sorts of rupture peculiar to high pressures. Here the author sets forth a variety of observations on rupture that are surprising, to say the least.

The thick-walled cylinders in which the high-pressure experiments are carried on act disconcertingly when they burst: failure starts at the outside wall in most instances, and the fracture line is sometimes radial, sometimes spiral. The rupturing pressure exceeds the tensile strength. The inner surface attains elongations far

beyond the ultimate stretch in static tension—for example 125 per cent in case of a cylinder of unhardened high-carbon steel. Under external pressure a cylinder may be so compressed that the hole is entirely closed.

Quartz cylinders under external pressure exhibit a flaking-off action at the inner wall surface, which may be related to the spalling of rock in deep tunnels. The reverse effect could not be produced; sands of various kinds compressed under 30,000 atmospheres in no instance "fused" together.

A solid steel cylinder, exposed over its curved surface (but not over its ends) to a pressure approaching its tensile strength, is broken by longitudinal tension, with large contraction of area in the case of ductile metal but with a clean square break in the case of glass-hard tool steel (or of glass). Actions of these kinds or the others described by Dr. Bridgman evidently need consideration in formulating theories of rupture. The author says, "I am exceedingly skeptical as to whether there is any such thing as a genuine criterion of rupture."

Old Subject in New Garb

REVIEWED BY CLYDE T. MORRIS
Professor of Civil Engineering, Ohio State University

THEORY OF SIMPLE STRUCTURES—By Thomas Clark Shedd, C.E., M.Am.Soc.C.E., and Jamison Vawter, C.E., M.Am.Soc. C.E., Associate Professors of Civil Engineering, University of Illinois, New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 345; tables, line cuts and illustrations. $3.75.

SHEDD and Vawter's new book, "Theory of Simple Structures," is refreshing in that it presents an old subject in a new garb, which is essentially that of a laboratory manual. The subject is developed by the solution of a large number of illustrative problems and the inclusion of a vast multitude of other problems to be solved by the student.

It is a "textbook intended for the student beginning the study of structural analysis and is devoted exclusively to the fundamentals of the theory of simple structures." Indeterminate stresses are not touched upon, except in the case of stresses in portal frames and building frames subject to lateral loads, and these are treated by making assumptions as to points of contra-flexure and distribution of shears which render their analysis statically determinate. Influence lines are introduced in the treatment of moving loads, but their use is rather qualitative than quantitative. Graphic methods are explained but not emphasized and the statement is made "that *graphic statics* is not in any sense a separate method." The statement is made at several points that the methods given serve as a means of "estimating" the resulting stresses with sufficient accuracy for purposes of design. The calling of this fact to the attention of the student is to be commended.

The typography, figures and diagrams are good, but the forms given for calculation of reactions and stresses are sometimes not sufficiently explained to be evident to one who is not thoroughly familiar with the subject. It is therefore questionable whether the statement in the preface that "it is especially adapted to the needs of men studying alone" is true. This would, of course, depend upon the thoroughness of the preparation of the student in elementary mechanics. Problems that frequently puzzle the student are sometimes dismissed with the statement, "Although the calculations may become tedious, there are no new principles involved, and the student is fully prepared for such a problem if he thoroughly understands the previous discussions." This may be eminently proper when a competent instructor is at hand to guide the student, but it is far from satisfying to the man working alone.

Four Russian Engineers

THE VOLGA FLOWS TO THE CASPIAN SEA—By Boris Pilnyak. Translated from the Russian by Charles Malamuth. New York: Cosmopolitan Book Corporation. Cloth; 6x8 in.; pp. 353. $2.50.

PILNYAK, a Russian novelist of the day, in his "The Volga Flows to the Caspian Sea," has made the construction of a huge dam the background of a story typifying activities under the industrial revolution in Soviet Russia. Four engineers are the chief actors. The account of their work on the dam is vaguely sketched in the impressionistic manner, but their marital and extra-marital experiences are given in more realistic detail.

The three main features of the story, aside from the love affairs, are a strike of the women laborers on the dam as a protest against one of the engineers whose second wife committed suicide; the refusal of a worker's union to approve a project of another one of the engineers; and the joining of both these engineers in a plot to blow up the dam, the motive for which is unexplained except for two or three casual references to gold paid by a British engineer.

Toward the close of the book Prof. Poletika, the chief designing engineer of the dam, outlines a much larger project to Fyodor Ivanovich Sadykov, chief engineer of construction:

Fyodor Ivanovich, I spoke to you about the deserts that advance on mankind, the deserts that have destroyed Atlantis, Arabia, Mesopotamia, Mongolia, our Transvolga region. The desert is advancing on us, on western Siberia and on European Russia; it is creeping up to Moscow . . . Deserts are more terrible than war. Deserts arise because the equilibrium between heat and moisture is upset.

I have worked out a project to stop the desert's advance on us. . . . It is necessary to place a monolith across the Volga near Kamyshin. . . . In this desert new lakes and rivers will arise, thousands of square kilometers will be covered with water, hundreds of thousands of square kilometers will revive, wrested from the desert. Only one-tenth of the Volga waters will reach the sea, and the Volga will flow into the Caspian, not where it does now, but in the Komsomoltsy Bay; the remainder of the water, diffused in new rivers, canals and lakes, will disappear into the sky in the form of steam, creating a steam curtain against the desert. The water will surrender to the earth with rains and storms, leaving humus for the cultivation of cotton and rice. . . . Lands now submerged will emerge from the bottom of the sea.

Many years have I worked over this problem. I have drawn up maps, I have gone over the trusses [?] and the sections. . . . to create an outpost of culture, to stop the desert—such are the possibilities of socialism. . . . Dear Fyodor Ivanovich, I am old. I'm not strong enough to carry out these plans. I have a request to make. I shall give you my projects, maps, plans, drawings, calculations. Our government will help you. And you will see to it that they are carried out. Lyubov [the professor's daughter, a government archeologist] will go along with you to dig there, too, for the past centuries.

The Straight and Narrow Path

GRAFT IN BUSINESS—By John T. Flynn, author of "Investment Trusts Gone Wrong." New York: The Vanguard Press. Cloth; 6x9 in.; pp. 318. $3.

GRAFT usually connotes misconduct in public office; it is seldom realized that opportunities for personal profit through the misuse of authority are fully as prevalent in the business world as in government, and that the chances of detection are infinitely less. For political

office holders are under the continuous scrutiny of those anxious to supplant them, whereas the affairs of private corporations are conducted in secrecy, and a revolt against the established management is rare as long as the golden stream of dividends is maintained.

In John T. Flynn's "Graft in Business" the secret and unauthorized tribute paid to individuals is divided into two main classes. The first covers what is usually termed commercial bribery, consisting mainly of secret commissions passed to employees recommending, specifying or purchasing supplies or equipment. The practice is well known and generally deprecated; yet few realize its wide extent or the size of the burden which it lays upon industry and commerce. Efforts to stamp it out have been generally unsuccessful. Several attempts at congressional legislation under the interstate commerce clause have been fruitless. The few state laws apply only to intrastate transactions; they are seldom enforced because definite proof of guilt is difficult and because any serious attempt to eliminate such payments in a single state would leave its industries helpless against the unrestricted competition from outside its borders. Many trade associations have campaigned against the practice, a few of them with a fair degree of success. The only real remedy seems to be simultaneous state and federal legislation, and that is difficult to obtain.

Far more impressive than this petty grafting is the subject discussed in the second part of the book—the ethical laxity now tolerated among the officers and directors of corporations. In theory these men represent the individual stockholders and act always with their best interests at heart. In practice, however, there is a regrettable tendency to subordinate the welfare of a scattered and, for all practical purposes, impotent constituency to the profits of powerful factions and individuals whose financial interest in the corporation may be negligible. The rapid growth of holding companies and interlocking directorates has aggravated this condition. In proof of his contention the author presents an impressive list of specific cases, giving names, dates and places. Most of these have come to light as the result of chance, a fact that leads the reader to wonder just how effective our boasted standards of business honesty may be.

Although the unthinking may consider Mr. Flynn a modern Don Quixote tilting at windmills, those conscious of the serious defects in our present industrial system (and who, in these days, is not?) will find in his book much perturbing and pertinent criticism of the existing order.

New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

THE ADJUSTMENT OF A QUADRILATERAL—By Ernest Joseph Townsend, Michigan College of Mining and Technology. A thesis written under the supervision of Profs. C. H. Baxter and R. C. Matson. Paper; 8x11 in.; pp. 23; lithographed from typewritten manuscript. 75c. from director, Michigan College of Mining and Technology, Houston, Mich.

A detailed description and comparison of three methods of quadrilateral adjustment. The conclusion reached is that although there is little difference in accuracy, one of the methods shows a considerable saving in the time required for computation.

THE BALANCING OF MACHINERY—By Norman Fletcher, A.M.I.Mech.E., London: Emmott & Co. Ltd., 28 Bedford St., Strand, W.C.2. Cloth; 6x9 in. pp. 172; halftones, tables and line cuts. 10s.

In his preface the author states that the object of his book is to give "in a comparatively simple practical form a résumé of the factors affecting balance, together with a description of the better-known apparatus now available for detecting unbalance, as well as the methods and calculations involved in the actual correction of bodies which are shown by the equipment to require it."

BUDGETING FOR SMALL CITIES—By A. E. Buck, Institute of Public Administration, Publication Number 23. New York: Municipal Administration Service, 261 Broadway. Paper; 6x9 in.; pp. 21; tables. 25c.

DESIGN OF REINFORCED-CONCRETE ROAD SLAB from the Viewpoints of Strength and Economy. By L. E. Grinter, [illegible] C.E., Professor of Structural Engineering. College Station, Tex.: Texas Engineering Experiment Station. Paper; 6x9 in.; pp. 88; line cuts.

By a mischance this pamphlet was listed on Oct. 15, [illegible] as dealing with floor slabs instead of road slabs.

ECONOMIC HANDBOOK OF THE SOVIET UNION. New York: American-Russian Chamber of Commerce, 261 Fifth Ave. Paper; 5x7 in.; pp. 151; tables. $1.

THE ECONOMIC SIGNIFICANCE OF SPECIFICATIONS FOR MATERIALS: A Symposium Held Under the Joint Auspices of the American Society of Testing Materials and Western Society of Engineers, Chicago, Ill., June 25, 1931. Philadelphia: American Society for Testing Materials. Paper; 6x9 in.; pp. 46.

AN EPIDEMIOLOGICAL STUDY OF TYPHOID FEVER IN THE OHIO RIVER CITIES—By M. V. Veldee, Surgeon, U. S. Public Health Service. Reprint from *Public Health Reports*, June 5, 1931. Paper; 6x9 in.; pp. 27; 5c. from Superintendent of Documents, Washington, D. C.

FINANCIAL STATISTICS OF STATES, 1929—Compiled by Bureau of the Census. Paper; 6x9 in.; pp. 123; tables and graphs. 25c. from Superintendent of Documents, Washington, D. C.

GEOLOGISCH EN HYDROLOGISCH ONDERZOEK BIJ WATERBOUWKUNDIGE WERKEN: Voordracht, Gehouden Op [illegible] November, 1930, Voor Het Koninklijk Instituut Van Ingenieurs —Door W. F. J. M. Krul, Directeur van het Rijksbureau voor Drinkwatervoorziening. Paper; 8x12 in.; pp. 44; photographs and line cuts.

A paper on "geological and hydrological investigations in connection with hydraulic works." Read before the Royal Institute of Engineers, The Hague. Deals chiefly with unwatering of docks, foundations, etc. Has short summary, in English, on last page.

INVESTIGATIONS IN THE PROPORTIONING OF CONCRETE FOR HIGHWAYS—By A. T. Goldbeck, Director, Bureau of Engineering, National Crushed Stone Association, Inc., 1520 Fourteenth St., Washington, D. C. Paper; 6x9 in.; pp. [illegible] tables and line cuts.

MOTOR VEHICLE ACCIDENTS in the State of Connecticut, Seventh Study—By Richard Shelton Kirby, Associate Professor, Department of Civil Engineering, Yale University; with an introduction by Robbins B. Stoeckel, Commissioner of Motor Vehicles, State of Connecticut. New Haven: Yale University Press. Paper; 6x9 in.; pp. 47; line cuts and tables. 50c.

MUNICIPAL AND COUNTY FINANCIAL ADMINISTRATION—Report No. 3, Commission to Investigate County and Municipal Taxation and Expenditures [in New Jersey], J. F. Fitzpatrick, Jersey City, Secretary. Paper; 6x9 in.; pp. 12[illegible] tables.

NOISE AND VIBRATION ENGINEERING — By Stephen H. Slocum, Ph.D., M.Am.Soc.C.E. New York: D. Van Nostrand Co. Cloth; 6x9 in.; pp. 171; line cuts and illustrations. $2.7[illegible]

THE PHENOMENON OF SLIP IN PLASTIC MATERIALS—By A. Nádai, Research Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Authorized Reprint from the Copyrighted Proceedings of the American Society for Testing Materials, Philadelphia, Pa., Vol. 31, Part II, 1931. Paper; 6x9 in.; pp. 36; line cuts and illustrations.

THE PREPARATION OF ZONING ORDINANCES: A Guide for Municipal Officials and Others in the Arrangement of Provisions in Zoning Regulations—By the Advisory Committee on City Planning and Zoning of the U. S. Department of Commerce. Paper; 6x9 in.; pp. 28. 10c. from Superintendent of Documents, Washington, D. C. Building and Housing Publication BH16. Bureau of Standards.

PURCHASING LAWS for State, County and City Governments—By Russell Forbes, Ph.D., Secretary, National Municipal League, New York: National Association of Purchasing Agents, 11 Park Place. Paper; 5x8 in.; pp. 32.

Includes suggestions for state and municipal legislation. An earlier pamphlet by Mr. Forbes was entitled "Centralized Purchasing: A Sentry at the Tax Exit Gate"; a third one will outline a purchasing department and procedure.

THE ROEBLINGS: A Century of Engineers, Bridge-Builders and Industrialists. The Story of Three Generations of an Illustrious Family 1831-1931—By Hamilton Schuyler. Princeton, N. J.: Princeton University Press. Cloth; 6x9 in.; pp. 423; halftones and line cuts. $5.

SCHOOL VENTILATION: Principles and Practices—Final Contribution of the New York Commission on Ventilation, whose work was financed by the Milbank Memorial Fund 1913-23, 1926-29. New York: Bureau of Publications, Teachers College, Columbia University. Cloth; 5x8 in.; pp. 73. $1.

Brief summary of the work of the commission and its strongly put conclusions supporting window ventilation for schools and condemning legislation still in force in many states requiring the installation of mechanical systems of ventilation. Among the members of the commission were Prof. C.-E. A. Winslow, Yale University, Dwight D. Kimball, ventilation engineer, New York City, and Prof. Eade B. Phelps, Columbia University.

THEORY OF SIMPLE STRUCTURES—By Thomas Clark Shedd, C.E., M.Am.Soc.C.E., and Jamison Vawter, C.E., M.Am.Soc.C.E., Associate Professors of Civil Engineering, University of Illi-

nois. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 345; tables, line cuts and illustrations. $5.75.

UNEMPLOYMENT BULLETIN: Returns by Classes, Fifteenth Census of the United States: Washington, D. C.: Bureau of the Census. Paper; 6x9 in.; pp. 84; mostly tables.

WATER SUPPLY ENGINEERING—By Harold E. Babbitt, M.S., Professor of Sanitary Engineering, University of Illinois, and James J. Doland, B.S., C.E. Associate Professor of Civil Engineering, University of Illinois. Second Edition. Cloth; 6x9 in.; pp. 776; tables, line cuts and illustrations. $6.

The more important of the revisions "permitted without repagination of the first edition" have been made "in the sections on intermittent pumping, the hydraulics of wells, hollow core walls for dams, jet pumps, meters, and activated carbon." In addition, some of the problems have been replaced. The first edition was reviewed by John H. Gregory in these columns for Dec. 19, 1929.

LETTERS TO THE EDITOR

Better Professional Organizations Needed

Sir—Your editorial "Too Many Graduates?" in the issue of July 30 has brought forth several interesting letters, one in particular in the issue of Sept. 17 by Donald M. Baker. Mr. Baker asks several questions that I should like to undertake to answer. I shall quote the part to which I refer: "Do we not need a revamping and a lengthening of time spent in engineering education to afford a broader and better training for the few who are to fill the higher positions in the field, and a lesser training for the many who must always constitute the rank and file? Would not such a lengthened course assist in weeding out the many who can never hope to pass out of the subordinate class? A six-year course composed of three years of pre-engineering followed by three years of a technical course, with a proper separation of the two, might help the situation."

Who, Mr. Baker, will tell a young man entering college whether he will belong in the class to do routine technical work, or whether he should take a six-year course to qualify for an executive or administrative position? Or what will happen if there are too many six-year men for the positions available, or not enough in the subordinate class?

No, six years or 26 years wouldn't make an executive. In my experience I have found two good examples. One man finished a four-year course in three years and in that three years he practically memorized his text books word for word. But he had never learned to think. On construction work he tried to make the problem fit the text book, and when the text book didn't give the answer he had to call the general office on the telephone. The second example in my story is a man who never went to college but started on a survey party and for ten years worked and studied after working hours. Today, at the age of 38, he is an executive. He is a county engineer, being appointed on his hard work and study, and has helped to build up and is now in charge of one of the best county road systems of any county of its size in the country. I have also seen this man address a gathering of county engineers of his state on road construction and maintenance problems, and he expressed his own thoughts readily, accurately and logically. He has learned to think for himself and work out his own problems.

Which of these two men would Mr. Baker hire for an executive position? The college graduate would be chosen and the other man would be sentenced to hard labor on the survey party and thus the world would lose another good executive engineer.

Mr. Baker also mentions the apparent overcrowding of the profession by students who do not complete their studies. There are several reasons for this. Highway departments employ more civil engineers than any other one branch or organization. The average salary paid is from $90 to $150 per month. In the fall of 1929, when things were up and men scarce, I was offered a position with an Eastern state highway department for the large salary of $140 and it meant a move of some 600 miles from where I was at the time. A graduate just out of school finds these conditions and discovers that he can get a better salary in a stock-broker's office. And that is why so many C.E.'s or B.A.Sc.'s are found selling stocks.

I believe the greatest need of the engineering profession is legislation to take highway departments out of politics and at the same time set a fitting salary. A man who does not know from one day to the next when, through politics, someone else will step in and take his place cannot do efficient work. And when he is underpaid, that just adds to his worries. A recent survey of the 48 state highway departments showed the following average salaries, these being the positions a young man out of school would fill: rodman, $95; inspector, $144; levelman, $133, and draftsman, $155. The lowest salaries were for inspector, $80; levelman, $83, and draftsman, $91. Is it any wonder that college graduates drift into brokers' offices, and could you ask a six-year course man to accept one of these positions? Why waste six years in college when you can earn $80 a month digging ditches?

Engineering is continually called a profession, but you never saw a doctor or lawyer who would let you set the amount of his fee. When all engineers are united into one organization like lawyers and doctors, then we can set our own price on our labor and our work will then be worthy of the title "profession." The engineer works harder and gets less pay than men in any of the professions.

C. HAROLD LOUREE.

Tulsa, Okla.
Oct. 26, 1931.

Separate Licenses for Engineers

Sir—The present discussion as to the advisability of separate licenses for different classes of engineers and the recent editorials in *Engineering News-Record* in favor of such a procedure should bring forth many expressions of opinion, as there is much to be said in favor of the single license.

The profession of engineering is often compared with those of the physician and of the lawyer, and it is generally conceded that, because of lack of knowledge on the part of the public, engineering is not accorded proper public recognition and therefore does not have the professional standing to which it is entitled. And yet, as far as the writer knows, separate licenses are not issued to cover different classes of physicians and of lawyers. When a physician receives his certificate to practice, nothing is said as to whether he is going to be a surgeon confining his operations to one particular line, an eye, ear and nose specialist, or a family physician attending to the lesser ills of mankind. In the case of the lawyer, nothing is said as to whether he is going to practice criminal law or corporation law, or center his activities on real estate and mortgages. Generally it is years before either of these becomes a specialist, and separate licenses would only cause confusion in the public mind.

The same thing applies to engineers. Who can tell in what line an engineer just starting out in life will be ten years hence? We are all familiar with cases where an engineer starts out in one line and, through force of circumstances or because he finds he is better fitted for it, in a few years is in an entirely different line. The writer knows of mechanical engineers who have had charge of building and structural designs, structural engineers who have designed sewer and water lines, and numerous other combinations, and in every case the work was carried out in first-class and efficient manner. Furthermore, if an engineer is at the head of a large organization, his own immediate branch of engineering is generally lost sight of. He will have civil, mechanical, structural, electrical, sanitary and hydraulic engineers, architects and surveyors under his supervision, and will direct all of these activities. In such a case would an engineer have to take out a separate license in every line?

In your editorial of Oct. 1 you state that qualifications must be set low to permit each class of engineer to qualify under a single license. The writer cannot see why this is at all necessary, any more than it is necessary to do so for admission to a technical society. Qualifications in each group can be kept high, and each individual licensed according to his individual attainments in that group.

J. H. GANDOLFO.

Montclair, N. J.
Oct. 24, 1931.

NEWS OF THE WEEK

Federal Aid Proposed for City Water and Sewerage Systems

Federal aid, extended by the U. S. department of public health, in the construction of water and sewerage systems in those cities unable to finance the necessary improvements was advocated by W. J. Gray, consulting engineer, at the Missouri Water and Sewerage Conference on Oct. 22. Further to facilitate the financing of public improvements, it was urged that Missouri cities be allowed to authorize bond issues for that purpose upon the approval of only a simple majority of the voters instead of the two-thirds majority now required by state law. It was suggested that the cost of installing service connections to water mains or sewers should be advanced by the city and that the property owners should pay off the amount in the form of an annual service charge.

San Francisco Bay Toll Bridge Co. Defers Bond Interest Payment

The San Francisco Bay Toll Bridge Co., operating the private toll bridge across San Francisco Bay between San Mateo and Alameda counties, has temporarily deferred payment of the interest due on Nov. 1 on its first mortgage 6½ per cent sinking fund bonds. An adjustment plan, approved by the directors and the executive committee, will be put before the stockholders, under which payment of interest and sinking fund charges will be payable only to the extent money is earned. In addition an agreement has been entered into with the Raymond Concrete Pile Co., owner of the beneficial interest in a majority of the preferred stock, which provides that the company will make available a revolving credit fund of $150,000 obtained by issuance of junior securities, by the toll bridge company, the money to be used during a period of three years as needed to supply any deficiency in the bridge company's interest and sinking fund requirements on the first mortgage bonds.

Bond Market Bad, Missouri Stops Awarding Road Contracts

Because of the current business depression, which affects the market for state bonds, the Missouri state fund commission has decided to sell no more bonds. As a result T. H. Cutler, chief engineer of the state highway department, has announced that no more road contracts will be let this year. Secretary of State Becker has protested to Gov. Caulfield against the suspension of road construction work, pointing out that it will throw many men out of employment, will slow up completion of the state road system and is unnecessary because under state laws the state fund commission has authority to abandon competitive bidding and sell bonds at private sale to Missouri banks and investment houses.

80-m.g.d. Sewage Plant Opened

Operation of the new $800,000 sewage-treatment plant on the Hudson River at South Yonkers, N. Y., has been started by the Westchester County Sanitary Sewer Commission. The plant, which will screen and chlorinate 80 m.g.d. of sewage, was designed by W. W. Young, secretary of the commission, who also supervised construction.

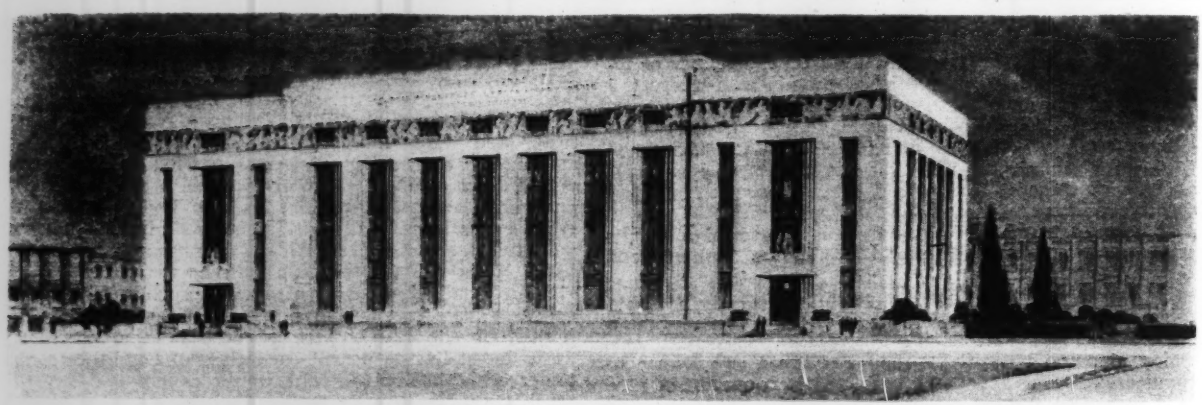
Los Angeles Civil Service Employees Favor 5-Day Week

Approval of plans for a five-day week for municipal employees, with a 4½ per cent salary reduction for employees receiving more than $125 a month, has been voted by members of the Civil Service Employees Protective League of Los Angeles, Calif. The league would use the resulting funds to maintain the present personnel. In the resolution, which has been presented to the city council, it is stated that the league believes that the most feasible manner of meeting the problem of reduced municipal income is alternating days of employment so as to make the five-day week effective and a 4½ per cent salary reduction for all employees receiving $125 a month or more. The league also suggests that officers or employees whose salaries are fixed by charter voluntarily contribute 4½ per cent.

Wyoming Orders Reservoirs Filled During First Flood

Orders to fill water-storage reservoirs in Wyoming, beginning with the first surplus supply available this fall, have been issued by John A. Whiting, state engineer. Authority for this action is provided by the 1925 amendment to the state water law.

Wyoming's legal interpretation of reservoir rights makes them equivalent to a direct diversion or ditch right, which, under the original law, would permit a reservoir owner to store water at any time when a supply is available in the stream in excess of prior right requirements. Some reservoir owners have been accustomed to wait until late in the season to begin storage, with the



ARCHITECT'S PERSPECTIVE OF NEW FEDERAL BUILDING AT ALBANY, N. Y.

Preliminary plans have been released by the U. S. treasury department for the new $1,850,000 federal building at Albany, N. Y. It is expected that construction work on this building will afford substantial unemployment relief in the Albany district. The plans were prepared by Electus D. Litchfield, consulting architect, New York, together with Gander, Gander & Gander, architects, and Norman R. Sturgis, associate, of Albany.

result that junior ditch rights have been needlessly interfered with and maximum beneficial use of the water was not obtained. Because of water shortage of the past season and under the authority of the 1925 amendment, storage for the coming season has been ordered to start Nov. 1 or as soon as practicable thereafter, in order to conserve a full reservoir supply without interfering with the late spring flow of the streams.

The state assumes, and its courts have generally held, that each reservoir is entitled to only one filling annually. Owners of reservoirs are being informed that they must start storage as soon as surplus water is available above the requirements of prior rights and any flow not stored, until the reservoir is filled, will be charged against their 1932 rights. This measure of state control is particularly necessary for the coming season because during 1931 the deficiency of the state's water supply obliged practically every reservoir to use not only all the water stored for that season but also the carry-over from previous years.

Materials Prices Not Yet Influenced by Rise in Grains and Metals

ALMOST hopeful sign of a possible upturn is the unusual activity in agricultural and metal prices during the last few weeks. Wheat and silver were the leaders, wheat rising 17c. from record low of six weeks ago, and silver from 28c. a month ago to 37¼c. on Nov. 10 and 35⅜c. Nov. 17. This activity, which is considered partly psychological and partly factual in origin, has not yet been communicated to building materials prices. A summary of current data follows:

Agricultural Products—The stimulating rise in wheat prices, resulting from insufficient crops in Canada, Argentina, France, Russia and Australia, considerably aided by market manipulation, induced rises in prices of the other grains (Fig. 1, left). Other agricultural products, as cotton, cocoa and hides, have shown a sensitiveness to some optimistic undercurrent.

Metals—The silver advance, accompanied by speculative buying in New York and London based on such factors as possible greater use of the metal in monetary systems and need in the Far East, is shown in Fig. 1, right. Curves for other metals are included. Lead is at a little more than 4c., after a week of 3¾c. Zinc is up ¼c. Copper continues at 7c. delivered Connecticut, the lowest price of all time despite international conferences on curtailment.

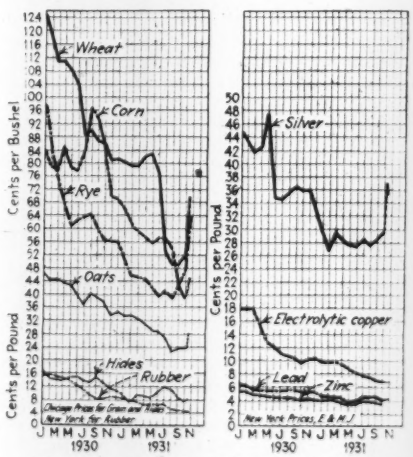


Fig. 1—Price trends of grains and metals, 1930-31

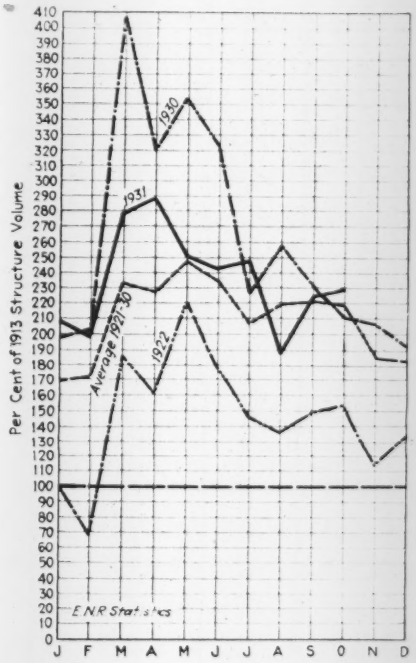


Fig. 2—Annual trends of heavy construction volume for ten years

(Dollar volume adjusted for cost variation; 1913 = 100)

Construction Materials — Practically no activity is recorded in construction materials prices. Movements in the principal markets have been as follows:

	Present	Previous	January 1931	January 1930
Steel, Pittsburgh	$1.60	$1.65 (Feb.)	$1.60	$1.90
Pine, N. Y.	47.50	50.00 (week ago)	53.50	58.00
Cement, N. Y.	1.59	1.64 (March)	1.89	2.03
Brick, N. Y.	10.00	10.50 (April)	11.00	11.00
Tile, N. J.	0.2388	since April, 1929		
ENR cost index	169.28	169.78 (Oct.)	194.48	208.96

Labor output, 87.5 per cent more than in 1926-1928.

Interesting, though not necessarily significant, is the increase in heavy construction volume in both September and October (Fig. 2), duplicated only once in the preceding seventeen years (in 1922). September showed an increase over August in only six of the seventeen years 1914-30, and October over September in only seven.

This year's September increase was exclusively in public-works contracts. In October, however, all the public-works groups except bridges were below September volume, and the month's increase of 6 per cent was due to industrial and commercial buildings. The commercial buildings total was the largest of the year, and included three buildings for the Radio City group (New York) to cost $50,000,000. The industrial building total was the largest since April. Weekly contract rates in millions of dollars for industrial and commercial awards respectively were: 3.5 and 17.2 in October; 2.5 and 13 in September; 3.5 and 11.9 average for the 43 weeks of the year.

Hoover Dam Notes

Two shifts were employed daily during the week ended Nov. 7 on stripping operations above the inlet portals of the Nevada diversion tunnels at Hoover Dam. Work was continued on excavation of inlet portals on the Arizona side. Driving of the 41 x 56-ft. enlarged headings is progressing at a satisfactory rate. To date progress from the outlet portals on the enlarged headings is: tunnel No. 2, 206 ft.; tunnel No. 3, 30.2 ft.; tunnel No. 4, 456 ft.

The pioneer heading in tunnel No. 3 was holed through between the center adit and upper portal on Nov. 2, completing this heading from lower portal to upper portal. Only 295 ft. remains to be driven in the pioneer headings in tunnel No. 2, to complete these headings from portal to portal. Driving of pioneer headings in the other two tunnels progressed during the week.

The total number of employed on the Hoover Dam project continues to be in the neighborhood of 2,700. The labor turnover under present favorable weather conditions is small.

Rapid progress is being made on the construction of the gravel screening plant at the three-way junction. Excavation has been completed for the concrete plant near the entrance of Black Canyon.

Boulder City has organized under a city manager form of government. Rough grading of the streets and the parking areas is 88 per cent complete. One-fourth of the curb and gutter work has been completed. Work on the administration building and on the municipal building is 48 per cent complete. Bids were opened Nov. 10 for the construction of nine five-room permanent residences. The low bid was $16,073. Six Companies, Inc., has completed 245 houses for its employees and has 30 more buildings in the course of construction.

A survey is being made by the U. S. Geological Survey and the Nevada state bureau of mines of the southern portion of Nevada in an effort to estimate the amount of Hoover Dam power that can be used in that region for mining purposes.

Bids for D. C. Incinerator Based on Detailed Plans

Bids for the construction of a refuse incinerator for the District of Columbia, to be opened Dec. 8, will be based upon detailed drawings of the furnaces, combustion chambers, flues, chimneys and buildings, thus departing from the accepted practice of receiving bids upon the contractor's own designs. This step has been taken as the result of a ruling by the comptroller general of the United States made last spring, stating that the customary method of procedure does not form the basis for a legal contract and that full plans and specifications must be prepared for the use of bidders. The drawings are so complete that any experienced general contractor will be able to bid, and the equipment to be used is procurable in the open market and is not encumbered by patent rights. The designs and specifications were prepared by Metcalf & Eddy, consulting engineers, of Boston, Mass.

Ralph Budd Selected as President of C.B.&Q.R.R.

Ralph Budd, who has been president of the Great Northern Railway since 1919, has been selected as president of the Chicago, Burlington & Quincy R.R., succeeding M. D. Williamson, who will become president of the New York Central Lines.

Mr. Budd, who is 52 years old, entered railroading in 1899 as rodman on the Chicago Great Western and later became assistant engineer. In 1902 he joined the Rock Island R.R. as roadmaster and later was general roadmaster and division engineer. He became chief engineer of the Panama R.R. in 1906 and two years later chief engineer of the Spokane, Portland & Seattle line. In 1913 he joined the Great Northern as assistant to the president. Afterward he became chief engineer, and in 1918 executive vice-president.

Petroleum Institute Raises Fund to Reduce Gas Tax

At the annual meeting of the American Petroleum Institute in Chicago Nov. 12 the board of directors resolved to "make as one of its major activities an effort to impress upon the public and upon public officials the necessity for an immediate decrease in the rate of taxation and for the strict application of the proceeds of such decreased taxation to the construction and use of highways alone." A fund of $100,000 is to be solicited from the membership and an organization to handle it will be set up.

Much time of the convention was taken up in discussion of the diversion of gas tax funds and the effect of bootlegging gas in lowering the price level to a ruinous figure. With the tax at present costing more per gallon than the wholesale price the bootlegger has such a great spread that demoralization of the price structure has been inevitable.

Gas-Weld Tests Demonstrated at Meeting

Ten types of tests and instruction of engineers and operators feature convention of Acetylene Association

METHODS of testing gas welds and the importance of reliable tests of welding were featured at the annual convention of the International Acetylene Association, held at Chicago on Nov. 11-13. An address on the growing importance of tests, by H. L. Whittemore, U. S. Bureau of Standards, served as an introduction to an interesting demonstration, which included the following tests: (1) visual inspection; (2) hammer and anvil nick-break; (3) bending test for ductility; (4) tension; (5) hardness; (6) specific gravity; (7) stethoscopic; (8) invisible ray; (9) compression and drift, (10) hydrostatic internal pressure. As a popular event, welded specimens were displayed and members estimated their tensile strength, which was then disclosed by means of a portable testing machine. Prizes were awarded to those making the closest estimates.

Structural steel welding was not included in the program, although this particular application has been prominent at previous meetings. However, the welding of pipe installations for steam and plumbing service in buildings and power plants was dealt with in a group of papers. Pipe-line welding was described by H. E. Rockefeller (Linde Air Products Co.), who suggested the use of stainless-steel pipe with welded joints for transportation or distribution of various materials. On a 26-in. line, an output of 25 joints per welder in a nine-hour day has been reached. Engineering acceptance of welding and how the industry can promote this acceptance was the subject of a paper by Prof. S. C. Hollister, Purdue University. That engineering graduates should understand the economics and principles of welding, so that they will realize it as something more than a substitute for riveting, was the argument in a paper by E. Lunn, consulting engineer, Chicago.

Gas welding and cutting in transportation service was covered by papers on railway shop work, the scrapping of steel cars, the construction of motor cars and the building of the U. S. airship "Akron." Gas-welded rail bonds were stated to be increasing steadily, both for electrification and signal operation circuits, the American Railway Engineering Association being quoted as approving this method of rail bonding. Several papers dealt with the training of welders.

Announcement was made of the award of the Morehead medal to A. Cressy Morrison, secretary of the association, as a recognition of his 25 years' work in the interests of the industry and the association. This annual award was established in 1922 in honor of James T. Morehead, who in 1892 developed the electric-furnace method of producing calcium carbide.

Decision of Justice Witschief on Mt. Vernon Prequalification

In a decision compelling the board of education of Mount Vernon, N. Y., to accept proposals from eleven bidders on the construction of the $750,000 Washington school after they had been declared incompetent through prequalification, Supreme Court Justice Witschief attacked the method of prequalifying in this case rather than the principle of prequalification. Lack of specific authority for prequalification either by statute or local ordinance, failure to state in advertising for bids that prequalification would be used, and failure to provide for appeal by rejected contractors are chief objections given in the opinion. The decision is abstracted in the following:

The advertisement provided that . . . each applicant [for plans and specifications] should submit to the board of education a financial statement and experience questionnaire as of current date . . . The advertisement makes no provision for the rejection of applications . . . nor does it specify the purpose, or the disposition to be made, of the financial statement and experience questionnaire.

The theory of the board of education appears to be that bids should not be received from unsubstantial and inexperienced contractors, and that, since bids may be rejected for such cause, those who may bid may be limited in advance of the bidding. There is much to be said in favor of this view . . . and it is not intended by this opinion to cast any reflection upon its [board of education] complete good faith.

The New York statute under which these cases must be disposed of expressly requires competitive bidding and does not prescribe that regulations for the determination of the lowest responsible bidder may be prescribed by ordinance. And even if it did, it does not appear that the city of Mount Vernon, or the board of education, has adopted any ordinance providing for the prequalification of bidders.

Board Restricts Competition

The board of education has attempted to prevent competition by limiting those who may enter into competition. It is alleged in the petitions, and is not denied, that eleven of the twenty applicants have been refused plans and specifications, thus limiting bidding to nine whose applications were granted. The danger in such a practice is as real as it is apparent. No standard is fixed for the determination of the financial responsibility or the qualification of prospective bidders by experience. No opportunity is offered for a hearing, or for the examination of the financial statements and experience questionnaires submitted by other prospective bidders. The door is left wide open to possible favoritism.

If what the board of education has done is to be approved, the number of those allowed to compete may be still further reduced and competition reduced to three or four or even fewer. The statutory requirement of competitive bidding is for the protection of the taxpayers, and is based upon the theory that competition will reduce prices. However praiseworthy the motives of the board of education, it has clearly erred in its attempt to prevent com-

petition by limiting those who may compete.

The corporation counsel argues that the discretion vested in the board of education to award the contract to the lowest responsible bidder confers upon the board the power to determine who shall bid. That does not necessarily follow. It is also argued that the elimination of bidders by prequalification will enable public officials to avoid much unjust criticism resulting from awards to others than lowest bidders. It seems quite as likely that the refusal to permit bids will result in greater criticism . . . The suggested cure appears to be worse than the disease.

Finally, it is suggested that the evils of promiscuous low bidding will be eliminated by the prequalification method. If there are such evils, and no doubt there are, they may be fully overcome by the exercise of the discretion vested in the board of education to award the contract to the lowest responsible bidder. That is a duty which rests upon the board, and should not be shirked by it whatever the consequences.

It is, therefore, concluded that the motions for preemptory writs of mandamus should be, and are, granted.

The opinion refused to consider references to prequalification elsewhere on the ground that in such cases the practice was authorized by specific statutes or ordinances. Likewise a brief on prequalification prepared by the Associated General Contractors was ignored because "the interest in that association in reducing the number of bidders is apparent."

Men Being Placed by New York Unemployment Bureau

In the ten days since the relief bureau for engineers in the New York metropolitan area was opened 529 engineers have registered as being out of work. Of these, 370 are from the Borough of Manhattan and 150 are from the outlying boroughs and New Jersey.

Jobs for 50 of these men have been found directly by the committee and several others have found work indirectly through leads by the bureau.

Destitute men with dependents are given first attention, as they can be given jobs by the city relief organization while the engineers' committee is raising its own funds. A classification of the destitute men shows that 11 per cent are members of the American Society of Civil Engineers, 3 per cent mining, 32 per cent mechanical, 19 per cent electrical and 32 per cent not members of any of the four societies.

The relief bureau has been set up by the Professional Engineers Committee on Unemployment, a joint committee representing the metropolitan sections of the four major engineering societies. Headquarters have been set up in the Engineering Societies Building in New York, but because the committee can do its best work by cooperating with community relief organizations regional representation is being arranged for whatever it appears necessary.

An appeal for contributions to the relief fund is to be made to all engineers in the metropolitan district. The metropolitan section of the Am.Soc.C.E. has loaned the committee $1,000 of its funds for administration expenses and one engineer has given $1,100 for administration expenses and urgent relief.

Merced Irrigation District Refinancing Plan Rejected

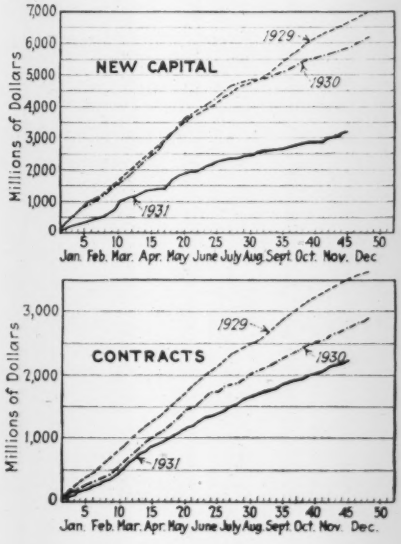
The proposed plan submitted by the bondholders' protective committee for refinancing the Merced (Calif.) Irrigation District has been rejected by the board of directors of the district. The original plan as outlined by the committee called for a temporary reduction on the interest rate on its bonds and the allocation of power revenues for the benefit of the bondholders (*ENR*, Aug. 13, 1931, p. 273). The interest rate was to be restored at the expiration of five years. The proposed reduction in bond interest would have permitted the reduction in tax rate of almost 50 per cent for the first year, with a gradual increase throughout the five-year period. The board of directors expressed approval of this original plan, although there was strong opposition.

The plan was then passed to the California District Securities Commission, a commission created by recent state legislation, for approval. The commission added the modification clause providing that, beginning in 1937, the district, with the consent of the commission, may in any year use some of the power revenue, this amount, however, not to exceed 10 per cent of the amount of revenue in the previous year. The board of directors refused to accept the amendment or to abide by its previous approval of the original plan. Failure of the directors and the bondholders' committee to agree upon a plan for refunding the district's outstanding bonds has necessitated a tax of $5.60 to be levied to meet bond issues and redemption requirements. In addition to the district tax of $5.60, there is a county tax of $3.20 and a city tax of $1.25.

Capital and Contracts

A slight increase occurred in new capital issues of $11,000,000 for the week ended Nov. 14 over the total of $8,000,000 for the preceding week. The weekly average for October was $20,000,000 and that for November last year $73,000,000. Public financing is slightly in the lead for the first half of the month, amounting to $11,000,000, compared with $8,000,000 in private issues.

For the period Jan. 1 to Nov. 14, 1931, inclusive, the total of all issues reached the sum of $3,145,000,000, compared with $5,658,000,000 in the corresponding part of 1930.



WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Federal Highway Aid Likely to Be Continued at Same Rate as in 1931 by Incoming Congress

INDICATIONS are that the committee on roads of the House of Representatives will recommend a continuance of federal-aid appropriations at the rate of $125,000,000 annually. The committee expects to begin hearings as soon as the House is organized, when consideration will be given to appropriations for an emergency fund to be appropriated in addition to the regular appropriation, all of which may be used as state funds. It is believed that the state highway departments will be in a position next year to expend to advantage $100,000,000 of emergency money. If the Democrats organize the House, Representative E. B. Almon, of Alabama, probably will be chairman of the committee. He has been a consistent supporter of larger amounts of federal aid than the committees in the past were willing to recommend.

St. Lawrence Treaty by Christmas

A treaty by Christmas appears to be the administration's ambition in its negotiations with the Canadian government on the St. Lawrence waterway. Secretary of State Stimson announced following a conference Nov. 14 with W. D. Herridge, the Canadian minister, that arrangements have been made for assembling immediately the joint engineering board to reach agreement on the plan for the development in the international rapids section. That the American engineers will agree to the two-stage development urged by the Canadian engineers in 1926 is a foregone conclusion.

Mississippi Flood Control

Property owners in the Atchafalaya basin are holding mass meetings in an effort to agree among themselves as to what they will advocate in the way of changes in the flood-control act. Major Gen. Lytle Brown, Chief of Engineers, will spend the early part of December in the lower valley for the sole purpose of talking personally to as large a number of people as possible and learn their views.

Personal Notes

D. C. COLEMAN, city manager of Miami, Fla., has tendered his resignation and L. L. Lee, assistant city manager, has been named acting city manager until a permanent appointment can be made.

R. E. MCMULLEN, senior engineer inspector foreman with the U. S. Bureau of Public Roads in Glacier National Park, on the Logan Pass section of the Transmountain highway, now has his headquarters in Portland, Ore.

GEORGE F. BLACKIE, assistant chief engineer, Nashville, Chattanooga & St. Louis Ry., Nashville, Tenn., has been appointed chief engineer, succeeding Hunter McDonald, who has retired. C. H. JOHNSON succeeds Mr. Blackie as assistant chief engineer.

H. G. BALCOM, consulting engineer, New York City, announces that J. L. Edwards, L. R. Hjorth, S. A. Callahan, A. J. Wilcox and G. A. Sallans, who have been with him for many years, have joined the firm as associate partners.

F. E. FAHY, formerly a structural engineer with Holabird & Root, is now an instructor in civil engineering at Antioch College, Yellow Springs, Ohio.

GEORGE H. HARRIS, assistant chief engineer of the Michigan Central R.R., has been appointed chief engineer, succeeding J. F. Deimling, who has resigned.

WILLIAM M. JOHNSTONE, vice-president and general manager of the Stanley Construction Co., of Hamilton, Ont., has been appointed assistant commissioner of works of Ottawa, Ont.

GEORGE B. SMITH, who had served 50 years as an engineer in the street laying-out department of Boston, Mass., has been retired, having reached the age of 70. In recognition of his long service, his fellow employees presented him with a purse of gold.

A. A. FISHER, general manager for the contracting firm of Henry Bickel Co., of Louisville, Ky., has been elected president of the company, succeeding Henry Bickel, who died recently.

H. D. SCHOONOVER, who has been resident highway engineer in the Ohio state highway department at Mount Gilead, has been appointed division engineer for Division No. 6, with headquarters at Columbus, succeeding L. K. Wisma, resigned.

Obituary

HENRI VAUTELET, formerly chief engineer of the Canadian Pacific Railway and who while in that position designed many bridges and viaducts in western Canada for that railroad, died on Nov. 13 in Montreal.

ROBERT DECOURCY WARD, professor of climatology in Harvard University, died on Nov. 12 after a short illness. He was nearly 64 years old. Prof. Ward was graduated from Harvard in 1889, and from 1890 to 1894 he was an assistant in physical geography at that institution and for the next two years an assistant in meteorology. In 1896 he became assistant professor of climatology and in 1910 professor. Prof. Ward was recognized as an international authority on climatology and from 1894 to 1896 was editor of the *American Meteorological Journal*.

GEORGE P. JANES, retired engineer who was engaged in the building of the Northern Pacific Railroad, died on Nov. 13 in his home in Roselle, N. J. Mr. Janes, who was born in Brooklyn, N. Y., 75 years ago, passed nearly twenty years in railroad construction in the West.

LEWIS TAYLOR ROBINSON, engineer in charge of the general engineering laboratory of the General Electric Co., Schenectady, N. Y., died suddenly from a heart attack on Nov. 3. Mr. Robinson, who was 63 years old, had been in charge of the laboratory since 1910.

WILLIAM O. ATWOOD, of Baltimore, Md., died on Nov. 10 from heart disease at the age of 69. Mr. Atwood went to Baltimore from Pennsylvania in 1885 and became a civil engineer for S. J. Martinet & Co. With three others he succeeded to the business twelve years later when the founder of the company died. He had served as a member of the board of commissioners for opening streets and was twice elected city surveyor. He also had been head of the municipal bureau of plans and surveys.

FRANK BAYLIES BOURNE, civil engineer in the office of the city engineer of Providence, R. I., died on Nov. 10. He would have been 80 years old on Nov. 11. Mr. Bourne had been connected with the city engineer's office for 58 years, going there on his graduation from Brown University in 1873. He was in charge of the street-line department of the city engineer's office.

CEDRIS ANDERSON, of Hastings-on-Hudson, N. Y., died of a heart attack Nov. 13 while listening to a lecture in the Columbia University school of business. Mr. Anderson, who was 42 years old, was graduated from the Massachusetts Institute of Technology in 1910 and gave up his practice as a civil engineer this fall to take a course to enable him to qualify for an executive position in the engineering field.

ERNEST C. KLIPSTEIN, a member of the architectural firm of Klipstein & Rathmann, of St. Louis, Mo., died on Nov. 8 of complications ensuing after an abdominal operation. He was 65 years old. Mr. Klipstein, who was a fellow of the American Institute of Architects and had served as president of the St. Louis chapter, had practiced architecture in St. Louis for 35 years.

JOHN E. JUDSON, vice-president of Ford, Bacon & Davis, consulting engineers, New York City, died in Stamford, Conn., on Nov. 10. Mr. Judson was graduated in the class of 1887 from the Sheffield scientific school of Yale University and after a few years in the engineering department of the New Haven Railroad became a consulting engineer in Pawtucket, R. I. He joined the New York firm nearly 40 years ago.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.: annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City: annual meeting Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago: annual meeting, St. Louis, Jan. 26-29.

NATIONAL PAVING BRICK ASSOCIATION, Washington: annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington: annual meeting, Pittsburgh, Jan. 27-29.

AMERICAN RAILWAY ENGINEERING ASSOCIATION has decided to limit the 1932 convention to two days (March 15-16), as in 1931, in view of the continued period of depression. There will be no exhibit next year, the National Railway Appliances Association having concluded that conditions do not warrant the expense.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA, Steel Works Section, on Nov. 17 listened to a paper on "Plasticity as Applied to Steel Products," by A. Nadai, research engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. By the use of torsion equipment Mr. Nadai demonstrated stress distribution in twisted steel bars by means of model tests.

NORTH DAKOTA WATER AND SEWAGE WORKS CONFERENCE held its third annual metting at Fargo Nov. 5-7, with more than 80 engineers, water and sewage works officials in attendance. Papers were read and discussed on methods of sewage disposal and on problems of waterworks officials; Officers were elected as follows: president, E. L. Lium, Grand Forks; vice-president, Sig Ravnos, Mandan; secretary-treasurer, A. L. Bavone, Bismarck. Minot was chosen as near year's meeting place.

COSTS AND CONTRACTS

ENR Index Numbers

	Cost			Volume	
Nov. 1,	1931	169.28	Oct.,	1931	229
Oct. 1,	1931	169.78	Sept.,	1931	225
Nov. 1,	1930	198.54	Oct.,	1930	241
Average,	1930	207.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913	.....	100.00	1913	.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Nov. 19, with some comparisons, total as follows:

(In Thousands of Dollars)

	Nov. 19, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$2,352	$1,928	$5,722
Other	10,742	10,640	25,104
Streets and roads	3,944	4,343	6,927
Other construction	37,957	19,015	14,124
Total	$54,995	$35,927	$51,877

Total, all classes, Jan. 1 to Nov. 19:
1931 ..... $2,303,241
1930 2,973,596

Construction Equipment and Materials

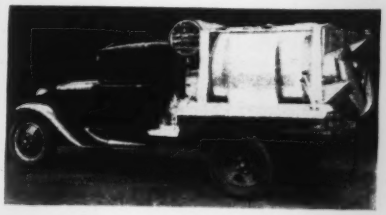
Turbine Pump Lifts Water 640 Ft.

A new record for lifting water from great depths is said to have been established in California, where a heavy-duty turbine pump installed by the Layne & Bowler Corp., Memphis, Tenn., for the Fontana Union Water Co., Fontana, Calif., is lifting 1,665 g.p.m. of water a vertical distance of 640 ft. The 18-in. turbine centrifugal pump unit is equipped with nineteen stages. The weight of the assembled column is 32 tons, and of the complete unit 41 tons. The pump column consists of 12-in. O.D. extra-heavy pipe with steel flanges and 5-in. extra-strong shaft-inclosing tubes. The $2\frac{15}{16}$-in. ground and polished shafting is made up in 20-ft. lengths with bearing spaces 6 ft. 8 in. apart. Power is provided by a 350-hp. General Electric vertical motor running at 1,000 r.p.m.

Small Truck Mixer and Rear-Lift Hoist Attachment

Recent developments in the truck mixer equipment field announced by the Jaeger Machine Co., Columbus, Ohio, include a revolving drum body with separate motor drive which has a capacity of 1-1½ cu.yd. as a truck mixer or 2 cu.yd. as an agitator and a rear-lift hydraulic hoist, which increases the usual discharge height of the body by 45 in., thus enlarging the area over which concrete may be chuted by 75 per cent.

The 1-1½ cu.yd. truck mixer is equipped with a 90-cu.ft. drum with a diameter of 55 in. and the usual Jaeger spiral mixing blades, giving a dual-mix action. A 65-gal. water tank is mounted at the front of the unit immediately above a 10-hp. four-cylinder radiator-cooled gasoline motor equipped with a starter deriving its current from the truck battery. The total weight of this outfit is 3,150 lb. When used simply as an agitator body to convey premixed concrete the water tank is omitted, the weight reduced to 2,900 lb. and the capacity increased to 2 cu.yd.

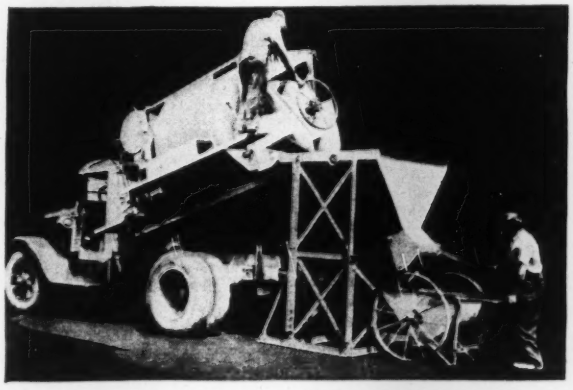


1½-yd. truck mixer on Ford chassis

The rear lift hoist attachment utilizes a Wood hydraulic double-support hoist driven from the power take-off of the truck. This is recommended for use with 2- and 3-cu.yd. units and can be attached either at the factory or in the field. The hoist frame alone adds 15 in. to the usual discharge height with body down; with body tilted to a maximum this height is increased to a total of 8 ft. from the roadway surface. Because of the action of the spiral mixing blades within the drum, rapid discharge of concrete of any slump is assured, even with the body tilted.

Shovel Attachment for Tractor

Adaptation of its high shovel attachment to the Case-Trackson heavy-duty crawler tractor has been announced by the Trackson Co., Milwaukee, Wis. The new unit has all the advantages of a low-lift shovel and in addition a sufficient dumping clearance (7 ft.) to load high-body trucks from the sides or rear. It is so designed that the bucket is held close to the tractor to insure positive digger action and proper balance. The mechanism that actuates the shovel is at the front of the tractor, permitting independent movement of the bucket whether the tractor is in motion or standing still. A single lever controls the bucket, raising it in ten seconds and lowering it in five, with a lifting capacity of 3,000 lb.



Tilted body discharges directly into floor hopper

Power-Driven Mower Trims Road Shoulders and Ditches

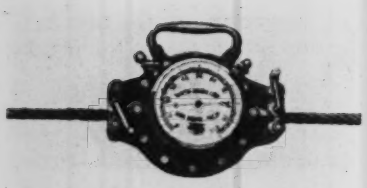
Manufacture and distribution of a motor-driven shoulder mowing machine designed for attachment to any motor truck by George Huntington, section foreman for the Minnesota state highway commission, has been taken over by the Toro Mfg. Co., Minneapolis, Minn. The mowing unit consists of a sickle with cutter bar attached to a steel frame which carries a small gasoline motor, all mounted on two pneumatic tire wheels in tandem. This unit is attached to any type of truck through a universal coupling and a telescoping arm. Guide chains leading to the front and rear of the truck maintain the unit in correct position, while the position of the sickle bar is controlled from the truck by a drum and cable operated by a large hand wheel. The sickle bar can be operated at practically any angle, so that the machine is adapted for cutting shoulders and also the down slope, bottom and up slope of ditches.

Power mower cuts small saplings and brush

Instrument Shows Cable Tension

A small, light tension indicator which, when placed on a wire or cable, will indicate the load carried or any variation therein is being produced by the Martin-Decker Corp., Long Beach, Calif. This instrument has no delicate adjustments, moving parts or springs of any kind. The pressure required to make a slight offset in the line between two fixed points is balanced by a fluid body behind a flexible diagram. This pressure is a direct measure of the load on the line and by means of calibration curves for various types of rope and cable can be translated directly into the load carried. The time required to clamp the instrument to the line, take a reading and remove it is only 1 min.

Two models are available—standard and heavy duty. The first, made of aluminum alloy, will measure stresses

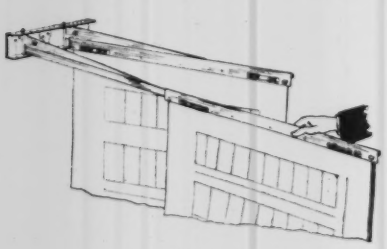


Cable-tension indicator

up to 16,000 lb. in lines of ¼- to ¾-in. diameter. It weighs 11½ lb. The larger, or heavy-duty, indicator is made of cast bronze, weighs 43 lb., will handle lines from ¾- to 2¾-in. diameter, and will read a maximum strain of 260,000 lb. on a single line. It can also be fitted with a recording gage in addition to the indicating gage, and either or both gages may be placed at any convenient point away from the instrument and the line.

Vertical Filing of Blueprints in All Sizes

Simple interchangeable units which make possible the vertical filing of blueprints, tracings and similar large sheets have been developed by Acco Products, Inc., Long Island City, N. Y. The basic unit, shown in the illustration, consists of a channel with a series of holes in the two flanges; a hanger arm supported in the channel by a pin; and a sheet holder that slides on a track along the hanger arm, and to which the sheets are secured by double-pronged paper



Vertical blueprint file

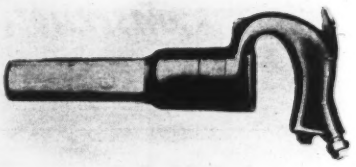
fasteners. With this system it is possible to file large and small sheets together and to refer briefly to drawings without removing them from the cabinet. Holders are made for all sizes of sheets, and can be placed on walls, desks or tables or in cabinets or closets.

Quick-Acting Hydraulic Jacks

All extra-heavy-duty jacks manufactured by the Hein-Werner Motor Parts Corp., Waukesha, Wis., now have unified control of both power and speed pumps, a feature that eliminates handle shifting and increases the raising speed. Both pumps are operated simultaneously from a single socket, the speed pump cutting out automatically as soon as the load is reached. This eliminates any possibility of the speed pump being overtaxed or broken through carelessness. The complete line of jacks produced by the company comprises 23 models of from 1½ to 30 tons capacity, all of which are designed, as a safety measure, to withstand twice the rated load.

Improved Chipping Hammer

Five sizes are included in a new line of ring valve chipping hammers introduced by the Chicago Pneumatic Tool Co., New York City. These vary in weight from 11 to 13½ lb., in length from 11¾ to 15½ in., and in capacity from 2,975 to 2,240 blows per minute. Easy maintenance is insured by the use of only five major parts, including a simple band ring valve placed over the



Ring valve chipping hammer

end of the cylinder. An adjustable exhaust deflector is provided that will stay in position on the cylinder without welding. The throttle lever on the handle is ¼ in. thick, with a lever pin of the same diameter.

Business Notes

SIMPLIFIED PRACTICE RECOMMENDATION R105-29, covering wheelbarrows, is now before members of the industry for their consideration and written approval, according to an announcement by the division of simplified practice of the U. S. Bureau of Standards.

FAIRBANKS, MORSE & Co., Chicago, Ill., has appointed A. W. Thompson, for the past five years Pacific Coast manager in charge of sales, as vice-president in charge of manufacturing.

PERFECTION STEEL BODY Co., Galion, Ohio, has started production on a complete line of steel bodies with hydraulic hoist equipment for all 1½-ton short-wheelbase chassis. This equipment is similar to that described in *ENR*, July 30, 1931, p. 198.

A. M. BYERS Co., Pittsburgh, Pa., has started production of genuine wrought-iron sheets in sizes up to 38x144 in. Gages available vary from 10 to 28.

HELTZEL STEEL FORM & IRON Co., Warren, Ohio, has completed the installation of additional machinery and equipment in its new factory addition.

TAYLOR, ROGERS & BLISS, INC., New York and Chicago, has appointed Roland D. Doane director of its dealer service division. Mr. Doane was formerly advertising and sales promotion manager of the Lehigh Portland Cement Co.

A. O. SMITH CORP., Milwaukee, Wis., has elected W. C. Heath vice-president in charge of research engineering and factory production. Mr. Heath was formerly vice-president in charge of engineering and manufacturing of Fairbanks, Morse & Co.

SHEFFIELD STEEL CORP., Kansas City, Mo., announces that R. L. Gray, formerly vice-president and general manager, has been elected president.

BYERS MACHINE Co., Ravenna, Ohio, has appointed the Beckwith Machinery Co., Pittsburgh, Pa., its distributor in the territory including western Pennsylvania, southeastern Ohio and parts of West Virginia within 100 miles of Pittsburgh.

HOMESTEAD VALVE MFG. Co., INC., Coraopolis, Pa., has appointed Chatard & Norris, Baltimore, Md., its representatives for the eastern part of Maryland and the District of Columbia.

THE TEXAS Co., New York City, has added calcium chloride to the line of asphaltic street and highway products marketed by its asphalt sales department.

AMERICAN HOIST & DERRICK Co., St. Paul, Minn., has appointed Ralph W. Payne its district railroad representative in the Southeastern states, with office at 613 Fifteenth St. N. W., Washington, D. C.

NORTH AMERICAN CEMENT CORP., Albany, N. Y., has elected Thomas J. Harte vice-president and general sales manager to succeed the late Frederick A. Boeye.

WESTINGHOUSE ELECTRIC & MFG. Co., East Pittsburgh, Pa., has elected W. L. Mellon a member of the executive committee to succeed the late Harrison Nesbit.

SIGNAL SERVICE CORP., Elizabeth, N. J., has acquired the traffic engineering division of the American Gas Accumulator Co., also of Elizabeth, and the Ray Signs Corp., New Haven, Conn. It will hereafter conduct the business of these groups in the development, production and sale of traffic devices. Officers of the company include: A. G. Newton, president; J. C. Haggart, vice-president; Guy Kelcey, sales manager.

AMES BALDWIN WYOMING SHOVEL Co., North Easton, Mass., announces sales personnel appointments as follows: general sales manager, Norbert T. Jacobs; assistant to general sales manager, C. B. Steffey; district sales managers, Lou Braden, Harold Cunningham, H. S. Bywater, George C. Barton, H. M. Pforsich. The newly-created position of merchandising and advertising director is held by H. T. Potter.

DARDELET THREADLOCK CORP., New York City, has licensed the Automatic Products Co. and the National Machine Products Co., both of Detroit, Mich., to manufacture bolts and nuts using the Dardelet self-locking screw thread.

LOUIS G. HENES, president of the Henes-Morgan Machinery Co., of San Francisco and Los Angeles, died in New York Nov. 1 at the age of 50. He had been in ill health for some time. A graduate of Columbia University and a member of the American Society of Mechanical Engineers, Mr. Henes first entered the machinery field in San Francisco as an employee of Pratt & Whitney Co. and was later with Harron, Rickard & McCone. In 1915 he organized the Louis G. Henes Machinery Co., which last summer became known as the Henes-Morgan Machinery Co. He was very active in Los Angeles and the San Francisco Machinery Dealers' associations.

New Publications

Self-Locking Thread—Advantages of the Dardelet self-locking thread as applied to sucker rod joints have been outlined in Bulletin 7 of the DARDELET THREADLOCK CORP., 120 Broadway, New York City.

Termite Control—How termites attack wood and how the resulting damage can be prevented by the use of creosote are told in a 15-p. booklet issued by the AYER & LORD TIE Co., Chicago, Ill.

Floor Plates—INLAND STEEL Co., First National Bank Building, Chicago, Ill., has published a folder describing the new Inland 4-way floor plate.

Electric Wiring—The Square D calculator, designed to compute complete wiring and motor data, is now being offered by the DIAMOND ELECTRICAL MFG. CO., LTD., 1320 East Sixteenth St., Los Angeles, Calif. This is a pocket-size celluloid computer containing two separate and distinct calculators: one for wiring, the other for motor data.

Sewage Treatment—Catalog 32 of the Pacific Flush-Tank Co., 136 Liberty St., New York City, covers the Downes floating cover and sludge-digestion equipment. It contains 48 pp. and many illustrations.

Groundwater Sterilization—Display material used at the Montreal convention of the American Public Health Association stressing the importance of groundwater sterilization has been gathered into a 16-p. booklet which may be obtained from the WALLACE & TIERNAN Co., INC., Newark, N. J.

Roller Chain—The unusual joint construction used in Morse roller chains is described in a 16-p. bulletin R-50 of the MORSE CHAIN Co., Ithaca, N. Y., which also contains size and price tables.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Bridges			
New York	Bridge	$1,000,000	Proposed
Cleveland	Bridge	1,250,000	Proposed
Spokane (Wash.)	Bridge, etc.	1,000,000	Proposed
Grade Elimination			
Ft. Worth	Viaducts, etc.	1,000,000	Proposed
Power and Lighting			
New York	Transmission lines	7,500,000	Day labor and separate contracts
Heating and Ventilating			
Philadelphia	Steam mains and heat supply extensions	4,000,000	Day labor for owners subsidiary company
Factories and Mills			
Whiting (Ind.)	Plant impvts, etc.	1,000,000	Day labor
Warehouses			
Saugus (Mass.)	Bulk oil plant	3,000,000	Proposed
Building			
Jamaica (N. Y.)	Court house	2,000,000	Proposed
New York	Bank and office	1,000,000	Contract
New York	Church	1,250,000	Contract

WATERWORKS

PROPOSED WORK

Calif., Bakersfield—Surveys waterworks, gas and power systems. W. D. Clarke, city mgr.

Calif., Los Angeles—Los Angeles Co. Flood Control Dist. soon takes bids 800 ft. diversion tunnel, 14 ft. diam., 290 ft. high on San Gabriel Dam 2, on West Fork San Gabriel Canyon. E. C. Eaton, 202 North Bway., engr.

Calif., Pasadena — City Council decided to call for bids 250,000 cu.yd. earth excav., at Pine Canyon Dam Site, in San Gabriel Canyon. Total est. $5,770,000. S. B. Morris, City Hall, engr. Noted Oct. 22 under "Contracts Awarded."

Calif., Santa Clara—For 2 m.g. water reservoir. G. Sullivan, city engr.

Calif., Signal Hill—City Council soon takes bids 20 in. c.i. steel or concrete pipe line from 30 acre water bearing land (recently purchased) to reservoir. $60,000. W. V. Thompson, supt. Water Dpt. Noted Apr. 30.

Ia., Sioux City—City Council, P. Smith, comr., filtration system. $300,000. L. Hintgen, city engr.

Ky., Versailles—For 32,000 ft. 8 in. c.i. pipe line, 2 electrically powered high lift pumps, 450 ft. lift. $50,000 bonds voted. W. K. Bell, Lexington, engr.

Mass., Newburyport — City, H. F. MacWilliams, chn. Water Bd., Town Hall, preliminary surveys, dam and filter beds, near Artichoke River Basin. $50,000. Whitman & Howard, 99 Broad St., Boston, engrs.

Mo., Princeton — Soon takes bids tank on tower, shallow well, iron removal plant and extending distribution system, $35,000. C. A. Haskins, 822 Finance Bldg., Kansas City, engr. Noted Nov. 12.

Mo., Van Buren—Preliminary plans waterworks and distribution lines. $12,000-$15,000. W. J. Gray, Holland Bldg., Springfield, engr.

N. H., Sunapee—Town, water system, dam to C. D. Marsh Constr. Co., Milton. Bids in December for completion water system. I. W. Jones, Milton, engr. Noted Oct. 22.

N. C., Canton—D. J. Kerr, mayor, new water plant, on Pigeon River. $75,000. Charles E. Waddell Co., Asheville, engrs.

Utah, Delta—H. Joseph, Regent Bldg., Salt Lake City, granted franchise distribution system, incl. gravity supply line. $25,000. McGonagle & Ullrich, Ness Bldg., Salt Lake City, engrs. Noted Dec. 11.

Wis., Oconto—City Council, P. T. Meeuwah, clk., waterworks improvements, incl. plant electrification, $61,000. Gordon & Bulot, 53 West Jackson Blvd., Chicago, Ill., engrs. Noted Oct. 22.

B. C., Vancouver—See "Sewers."

Ont., Haileybury—Town new waterworks supply from Constance Lake, incl. intake, pumphouse, pumps, c.i. main to reservoir. $20,000. J. F. Sumner, Haileybury, town engr. James, Proctor & Redfern, 36 Toronto St., Toronto, consult, engrs.

Ont., Oakville—Town, 6 in. c.i. mains, valves, hydrants, manholes, connections, for water main extension, Red Hills Sect. $20,000. R. F. Smith, Oakville, engr.

Ont., Sudbury—For 2,664 lin.ft. 12 in. c.i. trunk watermain in Regent St. $26,651. W. McMullen, Mackie Bldg., engr.

Ont., Toronto—York Twp., 4,950 ft. 12 in. c.i. trunk main with valves, hydrants, in Tretheway Dr. and Industry St. $30,000. T. S. Scott, 40 Jarvis St., engr.

BIDS ASKED

Calif., Fresno—Nov. 27, by D. M. Barnwell, clk. Fresno Co., deep well turbine pump, 100 g.p.m. against head of 120 ft. suction Col. 30 ft., 100 g.p.m. booster pump against head of 1,200 ft. with motor and complete equipment, 4,280 ft. discharge pipe line to reservoir, in connection with water system for Tubercular Unit.

D. C., Wash.—Nov. 25, at office Washington Suburban Sanitary Comm., Tower Bldg., 14th and K Sts., 140,000 ft. 6- to 24-in. centrifugal c.i. water pipe. Contr. 85-W. R. B. Morse, Hyattsville, Md., dist. ch. engr.; adv. E. N.-R. Nov. 19.

Mich., Ecorse—See "Contracts Awarded."

N. J., Wayne—Bd. Freeholders Passaic Co., Court House, Paterson, bids about Dec. 1, general contract pumping station, water piping at Valley View County grounds for additional waterworks $50,000. C. Ferguson, Court House, Paterson, co. engr.

N. Y., Long Island City—Nov. 24, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Amory Court, Bell and Cross Island, Ditmars Blvds., 220th and 45th Rds., Ankener, 21st, 08th Aves., 75th, 79th, 84th, 108th, 129th, 203rd, 205th, 217th, 220th, Farrington, Linden, 160th, 217th, Beach 12th and Beach 128th Sts.

Tex., Rusk—Nov. 23, by State Bd. Control, c/o C. Teer, chn., Austin, 700 ft. reservoir dam, maximum height 49 ft., with prospective and appurtenant structures, ½ mi. northeast of state hospital here, rock rip rap on gravel or sand blanket protective outlet and service pipe, 12 in. c.i. pipe under dam with gate valves, 76,000 cu.yd. wetted and rolled main embankment, 4,900 cu.yd. core trench excav., 4,450 cu.yd. unconsolidated blanket over dam; 3,400 cu.yd. embankment along railroad, 2,700 cu.yd. stripping under dam, 300 cu.yd. levee along spillway (wetted and rolled), 40 cu.yd. structural excav. at spillway outlet, 500 cu.yd. wet excav. in core trench, 6,000 sq.ft. steel sheet piling 8 to 36 ft. long in place. $35,000. H. Petts, Austin, engr.

Utah, Payson—See "Contracts Awarded."

Man., Brandon—Nov. 27, by G. F. Sykes, city clk., furnishing, installing two 3 m.g. (Imperial) motor driven waterworks pumps, bids on vertical type turbine pumps with vertical drive also considered. R. McFarlane, waterworks supt.

Ont., Kitchener—See "Contracts Awarded."

Ont., Sarnia—See "Contracts Awarded."

Ont., Windsor—See "Contracts Awarded."

Que., Three Rivers—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Long Beach—Furnishing, laying 17,215 ft. 24, 40 and 42 in. centrifugal cast rein.-con. pipe line in Spring St., to United Concrete Pipe Corp., 1347 West 208th St., Los Angeles, $70,682. Noted Oct. 22.

Calif., Sacramento—H. G. Denton, city clk., rein.-con. sedimentation unit for filtration plant, to Campbell Constr. Co., 800 R St., $379,747. Noted Oct. 22.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, Corrall Hollow Pipe Line in connection with Hetch Hetchy Water System, to Youdall Constr. Co., Matson Bldg., $928,550.

Conn., Rocky Hill—Rocky Hill Incorporated District, C. E. Holmes, pres., 450,000 gal. steel standpipe, 30 ft. diam., 85 ft. high, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston, Mass., $11,485. Est. $15,000. Noted Oct. 22.

Ill., Columbia—A. A. Lepp, city clk., 18 x 18 ft. brick pump house, 24,300 ft. 10 in. and 3,100 ft. 8 in. c.i. pipe, 4 x 8 in. tee, 8x4 in. cross, 1½ in. air valve, 10 in. gate; two 8 in. tees, 480 ft. 8 in. c.i. pipe, two 4 in. water meters and box, to Pittsburgh-Des Moines Steel Co., 10th and Southwest Tuttle Sts., Des Moines, Ia., $38,180; one 500 hp. gas driven and one 300 hp. motor driven pumps, to Reeves & Skinner Mchy. Co., 2211 Olive St., St. Louis, Mo., $34,320.

Ind., Fairmount—Town Bd., furnishing, laying 2,112 ft. 6 in. mains, to C. R. Morris, Selma, $2,163. Will purchase pump later. Noted Oct. 22.

Ind., Marion—Bd. P. Wks., new well, to A. D. Cook Co., Lawrenceburg. Est. $15,000.

Mass., Medfield—State, Dpt. Mental Diseases, State House, Boston, completing driven well system, to L. P. Federico & Sust, 5 Wales Pl., Dorchester. Est. $15,000 or more. Noted Oct. 1.

Mass., Woburn—Pumping station alterations, Horn Pond, to John MacDonald Constr. Co., 215 California St., Newton. Est. $15,000.

Mich., Ecorse—Village, W. J. Goodell, pres., 2 mi. 6- and 8 in. mains in factory district from 19th St. to river, village forces to give work to unemployed residents. $150,000.

Minn., Detroit Lakes — For 3 centrifugal pumps, to Fairbanks-Morse & Co., Park Sq., St. Paul, $4,359. Noted Oct. 22.

Mo., Maysville—City, general contract waterworks and dam, to Carrothers & Crouch, 2710 McGee St., Kansas City, $26,700: pumps, to Forslund Pump & Mchy. Co., 3033 Main St., Kansas City, $1,650; fire hose and fittings, to Eureka Fire Hose Mfg. Co., Midland Bldg., Kansas City, $955; mechanical filter equipment, to E. W. Bacharach & Co., Rialto Bldg., Kansas City, $4,750; meters, to Badger Meter Mfg. Co., 417 East 13th St., Kansas City, $1,000. Grand total $35,055. Noted Oct. 22.

Neb., Albion—City, F. M. Sillik, clk., 9,165 ft. 4- to 10-in. pipe; 5 tons c.i. specials; 3 hydrants; 38 valves and boxes; 760 ft. 6 in. and 100 ft. 8 in. pipe removed; 23 wet connections; 700 ft. trench under pavement, to H. McCray, Albion, $16,000. Est. $17,339. Noted Oct. 1.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 71st St., to S. Gallucci, 33 Railroad Ave., Corona, $6,928. Noted Oct. 15.

N. Y., Ocean Beach—Bd. Village Trustees, at office LeR. B. Iserman, village atty., 115 Bway., New York, water pipe, steel reservoir, to G. S. Lundy, Woodbridge, N. J.

O., Cleveland — City, exterior treatment of Parma Reservoir, 306 x 326 ft., brick, stone, to Hunkin-Conkey Constr. Co., Newman Stern Bldg., $252,000. Est. $300,000.

See proposal advertising on page 74

LEADITE

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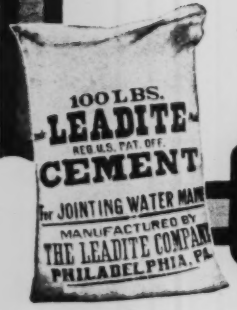

No Caulking

Waterworks (Continued)

Utah. Payson—City Council, raising Goose Nest Reservoir Dam, 10 ft., day labor. $15,000.

Ont., Sarnia—Twp., 4,040 ft. 6 in. c.i. mains in Erral and Long Rds., day labor. $16,000. G. Lewes, R. R. 2, engr.

Ont., Windsor—Waterworks extensions, 10,000 ft. curbing, concrete work, day labor under supervision of A. Desmarais, city engr. $72,000.

Que., Three Rivers—City Council prolonging aqueduct system, day labor. $100,000. F. Panneton, City Hall, engr. Noted Aug. 27.

SEWERS

PROPOSED WORK

Calif., Capistrano Beach—Capistrano Beach Sanitary Dist. received no bids Nov. 2, 9,332 lin.ft. 6- to 12-in. vitr. sewers, 31 standard and 1 drop manholes, 8 lampholes, 277 wyes, 110 lin.ft. 8 in. c.i. sewer. Burns-McDonnell-Smith, 1031 South Bway., Los Angeles, engrs. Noted Oct. 1. To exceed $25,000.

Calif., Signal Hill—State Bd. Health issued permit sewage disposal plant, Imhoff tank type with sand filter, on new site near Junipero Ave. on 28th St. Water purification and collection systems planned later. $70,000. Currie Eng. Co., Anderson Bldg., San Bernardino, engrs.

Ill., Decatur—Decatur Sanitary Dist. additions to primary treatment chambers. To exceed $50,000.

Ill., Urbana—City Council storm drainage in Lincoln Ave. $54,290.

Mass., Mansfield—Town, H. E. Everett, town mgr. and chn. com., Town Hall, preliminary sketches sewerage system. $300,000. F. A. Barbour, 73 Tremont St., Boston, engr.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Evergreen Sect., Bushwick; South 5th St., Wallabout; New Utrecht and Bath Beach with outlets in 15th, 17th and 19th Aves., West Flatbush; extending Bay Ridge relief sewers into inner areas and Flatbush Relief Sewers, in East New York and storm sewer outletting in Fresh Creek basin, extending Classon Ave. relief sewers, also relief sewers in South Brooklyn and Boro Hall areas.

O., Lebanon—Village, R. Carey, mayor, and M. W. Gustin, clk., sewage disposal plant, $35,000. Barstow & McCurdy, 622 Bway., Cincinnati, consult. engrs. **Maturity late in fall 1931.**

Okla., Claremore—Preliminary plans sanitary sewer extensions. $25,000. B. Sprangle, Claremore, engr.

Wis., Two Rivers—Complete sewerage system, $25,000. Engineer not appointed. J. Hoffman, clk.

Ont., Aurora — Council, sewerage system, $95,000. James, Proctor & Redfern, 1004 Excelsior Life Bldg., Toronto, engrs.

Ont., Islington—Etobicoke Twp. 8 in. and up storm and sanitary sewers, mostly vitr. tile pipe. $300,000. W. Walker, Islington, twp. engr.

Ont., Port Arthur—For 8 in. and up, vitr. tile sewers, manholes, catch basins, connections in Manitou St. $50,000. J. A. Antonisen, City Hall, engr.

Que., St. Hyacinthe—For 1,582 ft. 66 in. rein.-con. sewer manholes, behind Convent S.S. de la Presentation de Marie. $50,000. A. E. Bourbeau, St. Hyacinthe, engr.

BIDS ASKED

Ala., Birmingham—See "Contracts Awarded."

Mich., Flint—See "Contracts Awarded."

N. Y., Brooklyn—Nov. 25, by H. Hesterberg, pres. Brooklyn Boro., Boro Hall, sewers in Marine Parkway, Lott Pl. and 70th St.

N. Y., Newark—Nov. 24, by Municipal Bldg., Village Hall, reconstructing existing sewage treatment plant for activated sludge system. LeR. H. Wright, village engr. G. D. Holmes, 749 East Water St., Syracuse, consult. engr. Noted Nov. 5.

N. Y., New York—Nov. 24, by H. Bruckner, pres. Bronx Boro., Crotona Park, 3rd and Tremont Aves., sewers in Astor, Mace and Edison Aves.

N. Y., New York—Nov. 25, by S. Levy, pres. Manhattan Boro, Boro Hall, sewers in 10th Ave., 48th, 50th, 51st, and 52nd Sts.

N. Y., Syracuse—See "Contracts Awarded."

Pa., Munhall—Nov. 27, by L. Y. Woodward, boro secy., Municipal Bldg., 11 mi. terra cotta or rein.-con. sewers in East Zone east of Main St. F. B. Shafer, Municipal Bldg., engr.

R. I., Providence—Nov. 23, by Bd. Contr. & Supply, sewerage works in Union Ave., Babara, Redwood, Washington Bridgeway and Wilkie Sts. $25,000 or more.

Ont., Pembroke—See "Contracts Awarded."

Ont., Walkerville—See "Contracts Awarded."

CONTRACTS AWARDED

Ala., Birminham—City, A. J. Hawkins, engr., sewers, ditches, canals, public improvements, in connection with storm water drainage system, by Emergency Relief Forces. $500,000.

Conn., Waterbury—Trunk sewer from Naugatuck River via Steele Brook to here, to Cendella & Co., 68 School St., Milford. Est. $100,000.

Ia., Burlington—City Council, Cascade Sewer, to Miller Constr. Co., 1205 Lucas St., $22,639; sanitary sewer in 4th St. from Division to Elm Sts., to F. Guenther, 1960 Ernst St., at $0.99 per ft. and rock excav. at $1.65 per cu.yd.

Ky., Louisville—Commissioners of Sewerage, 400 Marion E. Taylor Bldg., Montana Avenue Sewer, Sect. B, Contr. 61, incl. 4,186 ft. 4 ft. 9 in. x 7 ft. 1½ in. inverted egg section rein.-con. sewer, 580 lf. circular rein.-con. sewer 54 in. diam., to Henry Bickel Co., 435 Garden St., $9,3099. Noted Oct. 15.

Ky., Louisville—Bd. Comrs. of Sewerage, 400 Marion E. Taylor Bldg., Beargrass Creek Improvement, Sect. J-1, Contr. 60, incl. 234 lin.ft. rein.-con. open channel, 40 ft wide, 9 ft. walls, 70 ft. rein.-con. open channel, 40 ft. wide, 14 ft. 6½ in. walls, outlet structure, diversion and regulator chambers, inverted siphon with 3 lines 24 in. c.i. pipe, connections, 3,840 cu.yd. earth excav., 1,010 cu.yd. rein.-con. or plain concrete, 124,000 lb. steel reinforcing bars, 4,100 lin.ft. timber piles, to C. Bettenhauser, Chimney Park (Chicago), Ill., $30,000. Noted Sept. 24.

Ky., Louisville—Commissioners of Sewerage, 400 Marion E. Taylor Bldg., F. D. Rash, acting chn., Montana Ave. Sewer, Sect. 3, Contr. 62, incl. 1,360 ft. 48 in. and 1,038 lin.ft. 36 in. circular rein.-con. sewer, 292 lin.ft. 24 in. circular vitr. pipe sewer laid in concrete cradle, 2,690 lin.ft. open trench work, 740 cu.yd. rein.-con., 96,000 lb. steel reinforcing bars, 292 lin.ft. 24 in. vitr. pipe, to George M. Eady Co., 340 Byrne St., $34,805. Noted Oct. 22.

Mich., Flint—For concrete, vitr. sewers, Sanitary South Side Interceptor to Howard Ave.; Kearsley Creek to Branch Rd.; storm trunk sewers in Whaley Park and West Side, force account. $374,000. Material to be purchased. O. K. Philip, Flint, dir. P. Wks.

Mich., Owosso—For Main Interceptor Sewer, 1 mi. 18- to 48-in. concrete and vitr. pipe, brick, concrete manholes, to K. Young, Ypsilanti, $48,233. Noted Oct. 22.

Mo., St. Louis—Bd. P. Serv., City Hall, Rock Creek Public Outlet Sewer, to Riley Contg. Co., 110 North 7th St., $76,449. Est. $105,000. Noted Oct. 29.

New York—Supervs. Westchester Co. Sanitary Sewer Comn., Court House, White Plains, Sect. Z, Mamaroneck Project, New Rochelle and Mamaroneck, to R. Nordone, 1014 East 241st St., New York, $72,945. Noted Oct. 22.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewer in Murdock Ave., to C. Turiano Contg. Co., 2913 Coddington Ave., $17,109. Noted Oct. 29.

N. Y., North Yonkers—Westchester Co. Sanitary Sewer Comn., Court House, White Plains, sterilization plant, Saunders Docks, to Northeastern Constr. Co., 101 Park Ave., New York, $736,800. Noted Oct. 22.

N. Y., Syracuse—City Council, sanitary and storm sewers, day labor. $661,000. W. W. Croning, State Tower Bldg., city engr.

O., Cleveland—Sewers in Hough Ave. from East 82nd to East 93rd Sts., to Joseph Kalill & Jackson, 4161 West 150th St., $364,447.

O., Cleveland—Sewer in Pearl Rd., to Angelo Marra Co., Green Rd., $63,084.

Okla., Ponca City—C. E. Norton, city clk., storm and sanitary sewer mains in various streets, to J. J. Moriarity, Ponca City, $27,036. Est. $35,000.

Pa., Allentown—Sewage disposal plant from Klines Island to Maple St. crossing under Lehigh River, incl. 1,485 ft. 36-in. rein.-con. pipe, Imhoff tank, to G. H. Hardner, Lentz Bldg., 6th and Ham Sts., $32,752. Est. $50,000.

Utah, Ogden—City Comrs., 7,500 lin.ft. 6- to 10-in. sanitary sewer extensions, to Wheelwright Constr. Co., Ogden, $21,817. Est. $27,644.

Utah, Salt Lake City—City Comrs., Unit 1, City Storm Sewer, to P. Paulsen, Vermont Bldg., $79,864 est., $81,800. Unit 2, to E. Smith, Salt Lake City, $20,933 est. $23,000. Noted Nov. 12.

Ont., Fergus — New sewerage system, to Ruscica Bros., 84 Woodycrest Ave., Toronto, $60,000. Noted Dec. 18.

Ont., Kitchener—Storm drain in David and Union Sts., Day labor under supervision S. Shupe, city engr. $25,000.

Ont., Pembroke—Town, 2,000 lin.ft. 24 in. c.i. pipe outlet, 4,000 ft. 12 to 14 in. trunk sewer in Lake St. to Ottawa River, day labor. $60,000. J. P. Howe, Pembroke, engr.

Ont., Walkerville—Council, relief sewer in Lincoln Rd., day labor, under supervision of H. W. Patterson, city engr. $100,000. Noted Sept. 24.

WASTE DISPOSAL

PROPOSED WORK

Que., Montreal East — Town Council, incinerator.

BIDS ASKED

R. I., Providence—Dec. 21, by City, Dpt. P. Wks, constructing, equipping incinerator plant, $500,000. S. F. Nolan, City Hall, engr. Noted May 14.

CONTRACTS AWARDED

Mass., Worcester — Decarie Incinerator Co., 342 Madison Ave., New York, awarded subcontract for superstructure garbage plant, Albany St., for Dpt. P. Wks., to L. Rocheford & Son, Inc., 44 Front St. Est. $100,000. Noted Oct. 22, under "Contracts Awarded."

BRIDGES

PROPOSED WORK

Ill., East St. Louis—East St. Louis Levee & Sanitary Dist., 217 Metropolitan Bldg., rejected bids Oct. 15. Highway Bridge 2 over Project 8, incl. one 130 ft. riveted through truss central span, two 65 ft. riveted pony truss approach spans with 22 ft. rein.-con. roadway, on concrete piers, abutments, also double 10 x 5.5 ft. rein.-con. culvert, 90 ft. long with wingwalls, for auxiliary of Project 8, State Aid Route 39. Will readvertise. E. F. Harper, c-o owner, engr. Noted Sept. 24.

Mass., Newton—City, F. E. Stuart, comr., City Hall, concrete bridge, Riverside St. $75,000.

New York — A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, bridge over Newton Creek at Meeker Ave. To exceed $1,000,000. Noted Nov. 12.

O., Cleveland — Bd. Comrs. Cuyahoga Co. structural steel, rein.-con. bridge, Broadway relocation at East 26th St. $1,250,000. A. M. Felgate, Court House, bridge engr.

Tex., Fort Worth—Tarrant Co., c-o W. E. Yancy, aud., Fort Worth, bridge over Trinity River between Trinity and Forest Park. $25,000 or more. W. Stevens, Fort Worth, engr.

Wash., Seattle—Bd. P. Wks., City Hall, bids after Jan. 1, reconstructing University Ave. Bridge across Lake Union Canal, $650,000 incl. temporary bridge to handle traffic, to cost $50,000. D. W. Morris, city engr.

Wash., Spokane — City Plan Comn., B. H. Kizer, pres., improving 2 bypass streets and bridge across Spokane River at Elm St. To exceed $1,000,000. A. D. Butler, city engr.

Wis., DePere—Brown Co. Green Bay, 1,900 ft. bascule span bridge, 30 ft. concrete roadway over Fox River. $160,000. O. F. Culbertson, Green Bay, co. engr.

Wis., Green Bay—City, M. P. Doherty, clk., soon takes bids bridge to have steel girders, concrete substructure, on wood piles, at Monroe Ave. $150,000. King & Smith, 111 East Wisconsin Ave., Milwaukee, engrs.

Ont., Welland—For 300 ft. concrete or steel span bridge, over Welland River, Main St. $75,000. C. L. Conlson, City Hall, engr. A. B. Creelock, 156 Yonge St., Toronto, consult. engr.

Que., St. Hyacinthe—For 528 ft. concrete bridge, 40 ft. over Yamaska River to connect St. Hyacinthe with La Providence. $175,000.

BIDS ASKED

Calif., Redondo Beach—Nov. 27, by C. C. Mengold, city clk., 1064 ft. Class A rein.-con. viaduct, 44 ft. roadway, 5 ft. sidewalk, D. L. Bundy, city engr.

Calif., Yreka—Nov. 25, by C. H. Purcell, engr. State Hy. Comm., Sacramento rein.-con. girder bridge, incl. three 40 ft. spans on concrete bents, abutments with wing walls across Cottonwood Creek, 21 mi. north of here, Siskiyou Co.

Iowa—State Hy. Comm., Ames, three 40 x 24 ft. I-beam span bridge in Keokuk Co., to Jansen Constr. Co., Kimballton, $7,400 — multiple span overhead crossing over railroads in Woodbury Co., to Snyder & Johnson, Huntsdale, $36,668—adding two 40 x 24 ft. I-beam approaches to 40 x 24 ft. I-beam span, and 32 x 20 ft. I-beam approach to 70 x 20 ft. pony truss bridge east of Haria, Shelby Co., to C. W. Akin, Atlantic, $8,984. Grand total $53,052. Noted Nov. 5.

Md., Elkton—See "Railways."

Michigan—Nov. 27, by W. J. Kingscott, dir. engr., 213 Watson Bldg., Grand Rapids, MBr. I of 78-9-6, Contrs. 1 and 2, two 35 ft. spans, 2 rein.-con. abutments, steel deck girder bridge, rein.-con. floor surface, spindle railing, 30 ft. roadway, two 2½ ft. sidewalks, St. Joseph Co., for State Hy. Comm., Lansing.

Minnesota—Dec. 1, by State Hy. Dpt., St. Paul, Bridge 5177, on S.P. 4-37-2, north of Little Fork—Bridge 5178, S.P. 11-38, near Pelland, both Koochiching Co.—Bridge 5175, S.P. 6-55 and Bridge 5181, near Odessa, Big Stone Co.—Bridge 4750, S.P. 15-32, at New Ulm.

New York—Dec. 7, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, 3 stone, timber faced rein.-con. structural steel bridges on Saw Mill River Parkway between Chappaqua and Mount Kisco, New Castle, J. Downer, Bronxville, ch. engr., adv. E.N.-R. Nov. 19.

Ohio—Nov. 27, by O. W. Merrell, dir. hys., Columbus, 62 ft. span steel I-beam bridge, 22 ft. roadway, 2 ft. 9 in. sidewalk, Sect. "Gloucester Bridge" Athens-New Lexington Rd., Athens Co. $22,422—62 ft. span steel I-beam bridge, 40 ft. roadway, two 5 ft. sidewalks, Sect. "Lancaster Bridge" Cincinnati-Zanesville Rd., Fairfield Co. $23,467—39 ft. span rein.-con. slab and girder bridge, 29 ft. roadway, approaches, Sect. "N" Barnesville-Bellaire Rd., Belmont Co. $16,274—18 ft. span concrete slab bridge, 24 ft. roadway, approaches, Sect. "C" Wilmington-Hillsboro Rd., Highland Co. $8,435—24 ft. span, concrete slab bridge, 30 ft. roadway, 22 ft. span, concrete slab bridge, 30 ft. roadway, and 21 ft. span concrete box culvert, 30 ft. roadway, approaches, Sect. "F" Logan-New Lexington Rd., Hocking Co. $19,588—25 ft. span concrete slab bridge, 24 ft. roadway, approaches, Sect. "C" Nelsonville-New Straitsville Rd., Hocking Co. $11,808—40 ft. span concrete beam bridge, 30 ft. roadway, two 5 ft. sidewalks, Sect. "South Charleston Bridge," Springfield-Washington C. H. Rd., Clark Co.

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Bridges (Continued)

$9,415—two 40 ft. span concrete beam bridge, 24 ft. roadway, 20 degrees R. F. Shew, Sect. "F" Findlay-Kenton Rd., Hancock Co. $15,299—36 ft. span, concrete beam bridge, 26 ft. roadway, 3 ft. sidewalk, Sect. "Jewett Bridge," Cadiz-Carrolton Rd., Harrison Co. $11,909—three 40 ft. span concrete beam bridge, 25 ft. roadway, Sect. "A-1" Columbus-Sandusky Rd., Seneca Co. $20,508—two 40 ft. span concrete beam bridge, 44 ft. roadway, two 5 ft. sidewalks, Sect. "A" Akron-Massillon Rd., Summit Co. $30,174—two 30 ft. span concrete beam bridge, 24 ft. roadway, two 3 ft. sidewalks, approaches, Sect. "J-2" McArthur-Chillicothe Rd., Vinton Co. $12,400—three 40 ft. span creosoted timber bridge, steel stringers, 24 ft. roadway, approaches, Sect. "M" Newark-Nellie Rd., Coshocton and Licking Counties $13,186—three 35 ft. span creosoted timber bridge, steel stringers, 29 ft. roadway, approaches, Sect. "E-1" Stillwater-Peoli-Western Rd., Harrison Co. $9,772—three 32 ft. span creosoted timber bridge with steel stringers, 24 ft. roadway, sect. "B" Hayesville-Nashville Rd., Holmes Co. $2,240—15 drainage structures, Sect. "C-1" Chardon-Madison Rd., Geauga Co. $11,885—three 40 ft. span cantilever deck plate bridge, approaches 40 ft. roadway, Sect. "K-2" Ohio River Rd., Gallia Co. $40,128—smaller bridges in Union, Holmes, Knox, Lake, Lucas, Meigs, Montgomery, Muskingum, Perry, Pickaway and Portage Counties $395,868. Total est. $680,778.

O., Akron—Summit Co. bids about Dec. 7, new 40 ft. concrete bridge over Little Cuyahoga River, at Hazel St., providing another outlet to Tallmadge St. $25,000. H. G. Sours, Akron, co. engr.

Okla., Keystone—State Hy. Dpt., Oklahoma City, taking bids 7 span 118 ft. rein.-con. bridge, 175.6 tons concrete, slab arch, 14.94 tons reinforcing steel, 145 ft. hand rail, Tulsa Co. $26,000. C. L. Wilson, Oklahoma City, hy. engr.

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, three 50 ft. span steel I-beam bridge on concrete bents, abutments, wing walls over Beaver Creek, Siskiyou Co., to W. J. Hoopes, 5140 14th Ave., Sacramento, $31,035—one 34 ft. and two 23 ft. span rein.-con. girder bridge on concrete bents, abutments over San Juan River and three 100 ft. span deck truss bridge, concrete deck on concrete piers with pile found., and ten 40 ft. rein.-con. girder spans on concrete pile bents over San Benito River, both San Benito Co., to G. J. Ulrich, Box 776, Moesto, $87,966—one 60 ft. and two 30 ft. span rein.-con. girder bridge, concrete piers, concrete pile found. and bents over Arroyo Calleguas, Ventura Co., to Merritt, Chapman & Scott, 720 Wilmington-San Pedro Rd., San Pedro, $25,755. Grand total $144,756. Noted Oct. 22.

Indiana—State Hy. Comn., Indianapolis, 40 ft. rein.-con. arch bridge, Clinton Co., to W. H. Hoffman, Lafayette, $5,933 est. $7,977—35 ft. rein.-con. arch bridge over Silver Creek, Floyd Co., to Ryan & Ryan, Washington, $6,585 est. $9,555 — 20 ft. rein.-con. slab bridge over Taylor Creek, Grant Co., to Sypolt Sand & Gravel Corp., Marion, $5,531 est. $8,080. Grand total $18,049. Noted Oct. 22.

Ia., Council Bluffs—Pottawattamie Co., 3 truss bridges, to Wickham Bridge & Pipe Co., 1905 West Bway., $23,380; grading, to W. P. Collins, Honey Creek, $1,951. Noted Oct. 29.

Louisiana — State Hy. Comn., Baton Rouge, bridge over Bayou Bievenue in Orleans and St. Bernard Parishes, to Vincennes Bridge Co., Vincennes, Ind., $57,315—bridge, approaches over Tangipahoa River, Tangipahoa Parish and over Bogue Chitto River, Washington Parish, to W. H. Groome & Sons, Fayette, Miss., $124,518 and $147,825 respectively—overhead crossing and concrete paving over railroads in Rapides Parish, to Fuller Constr. Co., 8217 Palmetto St., New Orleans, $84,730. Grand total $414,386. Noted Oct. 1, under "Streets and Roads."

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, MBr. 1 of 76-15-14, Contrs. 2 and 3, two 55 ft. spans, 2 rein.-con. abutments, steel deck girder, 40 ft. roadway, two 2½ ft. sidewalks, Shiawassee Co., for State Hy. Comn., Lansing, Contr. 2, to Fort Pitt Bridge Wks., Massillon, O. $3,714; Contr. 3, to W. J. Anschutz, Carrollton, $17,716.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, FBr. 1 of 61-13-9, Constrs. 1 and 2, three 20 ft. spans, 2 rein.-con. abutments, steel deck girder, rein.-con floors, ing. 40 ft. roadway, two 3 ft. sidewalks, Muskegon Co., for State Hy. Comn., Lansing, Contr. 1, to Fort Pitt Bridge Works, Massillon, O., $736; Contr. 2, to Price Bros. Co., Lansing, $22,061. Noted Oct. 22.

Michigan—H. G. Oakes, div. engr., Plymouth, RBr. 1 of 33-16-21, Contrs. 2 and 3, two 45 ft. spans, 2 rein.-con. abutments, steel deck girder, 40 ft. roadway, two 6 ft. sidewalks, Ingham Co., for State Hy. Comn., Lansing, Contr. 2, to McClintic-Marshall Corp., 1242 Book Bldg., Detroit, $2,604; Contr. 3, to L. A. Davidson, Flint, $36,721. Noted Oct. 15.

Michigan—H. G. Oakes, div. engr., Plymouth, MX 1 of 63-3-10, Contrs. 3 and 4, 160 ft. 5 in. bridge, 40 ft. roadway, rein.-con. abutments, counterfort type, steel deck girder with rein.-con. floor and surface, two 6 ft. sidewalks, Contr. 3, to R. C. Mahon Co., 8650 Elliot St., Detroit, $4,518; Contr. 4 to Jones Contg. Co., Pontiac, $24,927.

New York—F. S. Greene, supt. Dpt. P. Wks., State Office Bldg., Albany, piers for Troy-

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Menands Bridge, Contr. 2, Albany and Rensselaer Counties, to MacDonald-Spencer Eng. Co., Inc., 420 Lexington Ave., New York, $414,334. Noted Oct. 15.

N. Y., New York—A. Goldman, comr. Plant & Structures, Municipal Bldg., reconstructing tracks stringers, etc. on easterly lower deck approach spans Manhattan Bridge, to J. Roman, Inc., 122 Livingston St., Brooklyn, $78,400. Noted Oct. 29.

N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., elevated trackage system on 12th Ave. from 18th to 30th Sts., to James Stewart & Co., 230 Park Ave., structural steel, to McClintic Marshall Co., 39 Bway. Est. $800,000.

Ohio—O. W. Merrell, dir. hys., Columbus, 55 ft. span concrete beam bridge, 29 ft. roadway and approaches over Cedar Ford. Sect. "G" Winchester-Peebles Rd., Adams Co., to S. Monroe & Son, Portsmouth, $11,953—55 ft. span concrete beam bridge, 24 ft. roadway and approaches over Newell Run. Sect. "A" Ashland-Loudonville Rd., Ashland Co., to Wertz Co., Scofield Bldg., Cleveland, $9,979—60 ft. span, concrete beam bridge, 24 ft. roadway over Black Lick Creek, Sect. "D" Granville-Dublin Rd., Franklin Co., to Fritz-Pyle Constr. Co., 1400 North Grant Ave., Columbus, $12,493—36 ft. span concrete beam bridge, 24 ft. roadway and approaches over Bates Run, Sect. "A" West Unity-Montpelier Rd., Fulton Co., to Frank Herge, Inc., Malinta, $8,250—45 ft. span concrete beam bridge, 24 ft. roadway over Saezer's Creek and two 30 ft. span concrete beam bridge, 24 ft. roadway over North Branch Ceazer's Creek, Sect. "S" "R" Dayton-Chillicothe Rd., Green Co., to W. C. Iliff, Cedarville, $22,936 — three 40 ft. span concrete beam bridge, 24 ft. roadway and approaches over Deer Creek, Sect. "D" Delaware-London Rd., and three 45 ft. span concrete beam bridge, 24 ft. roadway over Little Darby Creek, Sect. "B" Delaware-London Rd., both Madison Co., Ross Constr. Co., 1201 Virginia Ave., Columbus, $23,198 and $23,672 respectively—36 ft. span concrete beam bridge, 34 ft. roadway and approaches over Fox Creek, Sect. "Q" National Rd., Muskingum Co., to E. L. Paul Zanesville, $18,903—36 ft. span, concrete beam bridge, 24 ft. roadway, over Wolfe Creek, Sect. "N-1" Findlay-Tiffin Rd., Seneca Co., to J. H. Jones & Son, Fostoria, $8,952 — concrete box culvert and channel changes, Sect. "Q" Mohicanville-Sullivan Rd., Ashland Co. and 10 x 16 ft. box culvert, Sect. "E" Mt. Gilead-Mansfield Rd., Morrow Co., to C. R. Chappelear Co., 1155 Cleveland Ave., Columbus, $5,141 and $5,913 respectively—15 x 21 ft. concrete box culvert Sect. "I" Marietta-McConnelsville Rd., Washington Co., and three 24 ft. span concrete slab bridge, 30 ft. roadway over Miller's Run, Sect. "T" Ohio River Rd., Monroe Co., to George A. Stein Contg. Co., Niles, $13,18 and $7,770 respectively—18 ft. span concrete slab bridge, 24 ft. roadway, widening concrete slab bridge from 17 to 24 ft., constructing top culvert and widening concrete slab bridge from 17 to 28 ft., Sect. "A" and others, West Unity-Montpelier Rd. and other roads, Fulton Co., to C. S. Ratzlaff, Napoleon, $8,336—two 16 ft. span concrete slab bridge, 24 ft. roadway over Indian Creek, Sect. "B" Troy-Urbana-Southern Rd., Miami Co., to John Frantz & Co., Sidney, $4,350—two 25 ft. span concrete slab bridge, 29 ft. roadway and approaches over Swift Creek, Sect. "I" Jackson-Piketon Rd., Pike Co., to I. J. Kuhner, Jackson, $5,207—two 25.11 ft. span concrete slab and girder bridge, 24 ft. roadway over Iron Creek, and widening concrete beam bridge from 19 ft. 8 in. to 27 ft. 8 in., Sects. "J" and "M" Toledo-Angola Rd., Fulton Co., to L. C. Garrison, Clayton, Mich., $14,774—two 40 ft. span steel I-beam, bridge, 29 ft. roadway over McMahon Creek, Sect. "R-2" St. Clairsville-Warnock Rd., Belmont Co., to C. C. Dodd Constr. Co., Spencer, W. Va., $11,506—40 ft. span steel I-beam bridge, 24 ft. roadway over LaCarpe Creek, Sect. "F" Bono-Port Clinton Rd., Ottawa Co., to Weis Bros. & Burmann, Elmore, $10,262—3 span, continuous steel I-beam bridge, 48 ft. center span and two 36 ft. spans, 40 ft. roadway and two 4.5 ft. sidewalks, Sect. "Mansfield" Mansfield-Ashland Rd., Richland Co., to Purdy Constr. Co., Mansfield, $27,653 — encased plate girder bridge, 67.08 ft. span, 34.5 ft. roadway, approaches over Swan Creek, Sect. "A-2" Perrysburg-Holland Rd., Lucas Co., to J. H. Berkebile & Sons, foot of Whittier St., Toledo, $19,745—steel beam bridge, four 70 ft. interior and two 58 ft. end spans, 40 ft. roadway and two 3 ft. sidewalks, approaches over Olentangy River at Stratford, and 21 ft. span, concrete slab bridge, 40 ft. roadway over Weiser Run and relocating road, Sect. "I" Columbus-Sandusky Rd., Delaware Co., to Uncapher & Gillespie, Marion, $76,723. Grand total $351,034. Noted Oct. 29.

Ohio—O. W. Merrell, dir. hys., Columbus, 40 ft. span concrete beam bridge, 24 ft. roadway over Tymochtee Creek, and 36 ft. span concrete bridge, 24 ft. roadway, Sect. "F" Marion-Kenton Rd., Marion Co., to Shoemaker & Tenant, Martel, $9,000—three 25 ft. span continuous slab bridge over Raccoon Creek, 30 ft. roadway and two 25 ft. span continuous slab bridge over branch Raccoon Creek, 30 ft. roadway, Sect. "I" Lima-Sandusky Rd., Sandusky Co., to M. L. Jones, Kansas, $14,405—25 ft. span concrete slab bridge, 26 ft. roadway, 30 ft. span, concrete beam bridge, 26 ft. roadway over Fox and Rathbun Runs, Sect. "A" Ashland-Wooster Rd., Wayne Co., to W. A. Yeagle, Clyde, $10,395—three 40 ft. span concrete beam bridge over Conotton Creek approaches, 24 ft. roadway, Sect. "D" Dellroy-Bowerston Rd., Carroll Co., to Mohican Constr. Co., New Philadelphia, $28,664. Grand total $62,464. Noted Oct. 29.

O., Cleveland—Cuyahoga Co., rein.-con. bridge North Woodland Rd., to Highway Constr. Co., Builders Exch. Bldg., $85,818. Est. $137,000. Noted Oct. 26 Daily.

Ont., Toronto—W. J. Stewart, mayor, City Hall, two span plate girder bridge, concrete flooring, piers, abutments, wood and steel sheet piling over Don River, at Keating St., Richardson Constr. Co., 10 Adelaide St. E., $58,587. Noted Oct. 15.

STREETS AND ROADS

BIDS ASKED

Ark., Hot Springs—City, bids about Jan. 2, grading, curbing, guttering, concrete paving north and south sides government park, Kenwood and Marion Sts., Central Park Addition and in Oaklawn Dist. $100,000. A. J. Annen, City Hall, engr.

California—Nov. 25, by C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, concrete paving 6 mi. road between point 2 mi. north of Solomon Summit and point 1.5 mi. south of Santa Maria, Santa Barbara Co.

Kansas—Nov. 23, by State Hy. Comn., Stockton, **(K.P. means Kansas Project and F.A.P. Federal Aid Project)**, traffic bound surfacing 4.409 mi. U. S. Hy. 40-N-11, F.A.P. 379-D Graham Co.—17.257 mi. U. S. Hy. 40N-11 F.A.P. 379-C—6348 mi. K.P. 1-16, F.A.P. 266-D both Rooks Co.—sand gravel or chat surfacing 14.662 mi. U. S. Hy. 40N-8, K.P. 1263, Sheridan Co.—16.52 mi. U. S. Hy. 40N-9, K.P. 1264 Graham Co.—10.029 mi. U. S. Hy. 83-22, K.P. 1265, Norton Co.—13.038 mi. U. S. Hy. 35-11 K.P. 1266 Phillips Co. W. V. Buck, Topeka, hy. engr.

Kansas—Nov. 25, by State Hy. Comn., County House, El Dorado **(P. means Project and K.P. Kansas Project)**, sand gravel or chats surfacing 11.953 mi. P. 160-15 K.P. 1288 Comanche Co. —1.503 mi. P. 4-2 K.P. 1279—5 mi. P. 4-3 K.P. 1280—1.996 mi. P. 4-4 K.P. 1281, all Barton Co.—18.066 mi. P. 95-25 K.P. 1282—7.233 mi. P. 77-9, K.P. 1283, both Butler Co.—18.384 mi. P. 166-3 K.P. 1285 Cowley Co. W. V. Buck, Topeka, hy. engr.

Maryland—Nov. 24, by State Roads Comm. G. C. Uhl, chn., Baltimore, gravel surfacing 4.40 mi. section state hy. from Chesapeake Beach toward Plum Point, Contr. C-54-84, Calvert Co. concrete paving 0.88 mi. section hy. from end Flower Ave. at Sligo Ave., in Takoma Park to Franklin Ave., Contr. M-196-35, Montgomery Co.

Michigan—Nov. 24, by H. W. Hagaman, div. engr., 208 Kresge Bldg., Port Huron, grading, drainage structures, concrete paving 2.001 mi. F079-37C-1 and M079-37C-2, Tuscola Co.—3.41 mi. M074-35C-1 and M079-31C-1, Sanilac and Tuscola Counties—2.263 mi. F074-36C-1, Sanilac Co., for State Hy. Comn., Lansing.

Michigan—Nov. 24, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, drainage structures, 7.118 mi. M041-42C-1, Kent Co., for State Hy. Comn., Lansing.

Michigan—Nov. 25, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, drainage, concrete paving 3.992 mi. F025-23C-2, Genesee Co., for State Hy. Comn., Lansing.

Michigan—Nov. 25, by H. G. Oakes, div. engr., Plymouth, grading, drainage structures 5.84 mi. F019-3C-9, Clinton Co., for State Hy. Comn., Lansing.

Minnesota—Dec. 1, by State Hy. Dpt., St. Paul, grading, culverts 19.7 mi. S.P. 6-27 and 6-54, Sect. 2, F.A.P. 161 and S.P. 6-54, Sect. 1, F.A.P. 343-C—18 mi. S.P. 6-50 Sect. 2, F.A.P. 81—12.5 mi., S.P. 6-53, F.A.P. 349-D —9.8 mi. S.P. 21-24, Sect. 3, F.A.P. 420-D— 12.1 mi. S.P. 47-21, Sect. 1, F.A.P. 82—6 mi. S.P. 58-21, Sect. 2.

New York—Dec. 8, by A. W. Brandt, comr. Hys., Albany, reconstructing roads in Rockland and Suffolk Counties; adv. E.N.-R. Nov. 19.

N. Y., Brooklyn—Nov. 25, by H. Hesterberg pres. Brooklyn Boro, Boro Hall, improving Glenwood Rd., Drew, Hegeman, New York, Scott and Sutter Aves., East 26th, East 46th and Hemlock Sts. $128,919.

N. Y., Long Island City—Nov. 23, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, curbing, sidewalks, sheet asphalt on concrete paving 62nd and 65th Rds., 107th, 26th, 33rd, Vandeventer, 111th, Lefferts, Alstyne, 95th, Beech, 103rd and Flushing Aves., 77th, 120th, 128th, 111th Penrod 196th 50th, 129th, 133rd, 111th Sts.

N. Y., New York—Nov. 24, by H. Bruckner pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks, to Bussing, Barkley and Tiemann Aves., Kennelworth and Dwight Pls.

N. Y., New York—Nov. 25, by S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, sheet asphalt on concrete repaving East 49th and West 79th Sts.

Rhode Island—Nov. 25, by State Bd. P. Roads, providence, **(F.A.P. means Federal Aid Project)**, bituminous macadam (penetration method) paving 3.7 mi. Douglas Pike, Smithfield, Contr. 3116, F.A.P. 70-A—rein.-con. paving 2.4 mi. Barbers Heights, Narragansett and North Kingstown, Contr. 3104, F.A.P. R-2—3,000 ft. Ironstone Rd., North Smithfield, Contr. 3124, F.A.P. 31-D—grading, drainage 6 mi. Washington Hy., Smithfield and Lincoln, Contr. 3123, F.A.P. 67-A.

Streets and Roads (Continued)

Wash., Seattle—Bd. P. Wks. bids about Dec. 1, pre-cast concrete slab paving 1 mi. Dexter Ave. $40,000. T. D. Hunt, city engr.

Wash., Seattle—Dec. 7, by Comrs. King Co., grading, concrete paving 10,452 sq.yd. Evergreen Point Rd. T. D. Hunt, Seattle, engr.

Wash., Seattle—Comrs. King Co. bids about Dec. 11, grading, widening 2 mi. Greenwood Ave., $39,000. T. D. Hunt, city engr.

Wash., Seattle—Bd. Comrs. King Co., bids about Jan. 1, paving 8 mi. 1st Ave. S., from Seattle to Des Moines Sts. $160,000. T. D. Hunt, city engr.

Wash., Spokane—Nov. 27, by L. Funk, comr. P. Wks., grading Standard St. from Indiana to Mission Ave.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, oil surfacing 17.5 mi. Topock-Kingman Hy., A.F.E. 6619, to Pearson-Dickerson and J. C. Morse, Riverside, Calif., $49,620; grading, cut back asphalt seal coating 22.5 mi. Florence-Tucson Hy., F.A.P. 90-A and 18-A-Reopened, to Skeels & Graham, Con. Bank Bldg., Tucson, $10,730.

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, concrete paving 9.7 mi. road between Los Alamos and point 2 mi. north of Solomon, 20 and 26 ft., Santa Barbara Co., to M. J. Bevanda, Stockton, $306,711; 0.6 mi. road between Del Mar and Solano Beach, San Diego Co., to B. G. Carroll, 4396 Maryland St., San Diego, $37,480. Noted Oct. 22.

Calif., El Segundo—Grading, bituminous full penetration paving Imperial Hy., to Los Angeles Paving Co., 3200 East Vernon Ave., Los Angeles, $65,206.

Calif., Long Beach—Curbing, water services 95,000 sq.ft. sidewalks, on Hullett St., et al., to Sully-Miller Constr. Co., 1500 7th St., $31,425. Noted Oct. 21.

Calif., Oakland — Alameda Co., grading 135,000 cu.yd. Grizzly Peak Blvd., to J. L. Conner, P. O. Box 86, Monterey, $33,485.

Calif., Redondo Beach — Grading, asphaltic concrete paving Vincent St., to Griffith Co., Railway Bldg., Los Angeles, $34,825. Noted Sept. 24.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., grading, concrete and waterbound macadam paving Hyde St., to Eaton & Smith, 715 Ocean Ave., $19,473.

Colorado—State Hy. Dpt., Denver, grading 4 mi. hy. between Manitou and Cascade. Federal Aid Project 158-A, Constr. Div. 1, El Paso Co., to Hamilton & Gleason Constr. Co., Tramway Bldg., Denver, $169,181.

Ill., Carlinville — Macoupin Co., grading 2.7666 mi. S.A.R. 16-A, Sect. 2-A and 2.3082 mi. S.A.R. 14, Sect. 3-A, M.F.T., to H. M. Johnson, Mount Olive, $11,758 and $11,753 respectively —rein.-con. bridge and culvert, S.A.R. 16-A, Sect. 2-B, to D. A. Chernus, Minneapolis, Minn., $16,636—concrete girder bridge, rein.-con. culvert, S.A.R. 14, Sect. 3-B, to Merrick Constr. Co., Carlinville, $7,770. Grand total $47,917. Noted Sept. 22.

Ill., Murphysboro—Jackson Co., gravel surfacing 1.664 mi. Sects. 1-X and 1-G, M.F.T., 16 ft., to Barnett & McCoy, Carbondale, $15,130 and $9,845 respectively. Noted Sept. 3.

Iowa—State Hy. Comn., Ames, grading, drainage structures 2.302 mi. road in Henry Co., to Natl. Constr. Co., 305 Arthur Bldg., Omaha, Neb., $3,334—gravel surfacing 8.759 mi. Adair Co. and 21.901 mi. Cass Co., to Kriege Constr. Co., Des Moines, $19,704 and $49,266 respectively—4.406 mi. P-707 and 3.5 mi. P-793, Fremont Co., to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., $9,258 and $7,777 respectively—5.825 mi. P-626 and 2.302 mi. P-775, Henry Co., to R. H. Dixon, Mystic, $5,154 and $4,482 respectively —3.5 mi. P-790 Warren Co., to L. J. Peters, 3400 Carlisle Rd., Des Moines, $6,545—6.5 mi. Warren Co. and 11 mi. Pottawattamie Co., to M. O. Weaver, Iowa Falls, $10,425 and $22,521 respectively—7.7 mi. Warren Co., to W. T. Kelley, Des Moines, $16,474. Grand total $154,940. Noted Nov. 5.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures 15.1 mi. Hopkinsville-Princeton Rd., Christian Co., to R. F. Pryor & Co., Mayfield, $76,156. Noted Oct. 22.

Louisiana—State Hy. Comn., Baton Rouge, to E. J. Kelly, New Orleans, shell surfacing 6.15 mi. Route 513 $42,223; 2.05 mi. Cassinode Rd. $13,281; 4 mi. Route 516 $23,072; 5.08 mi. Route 516 at Perry, $29,228, all Vermillion Parish—to H. P. and J. F. Egan, New Orleans, 3.5 mi. Jefferson Parish $45,659; 5.924 mi. Iberville Parish $43,745 — to Nelson Bros., Columbia Mutual Trust Bldg., Memphis, Tenn., 8.901 mi. La Fourche Parish $78,332 — to Shruptine Constr. Co., Oakdale, sand clay surfacing 3.935 mi. Rapides Parish $6,467—to Forgy, Hanson & McCorkle, Inc., Alexandria, 6.078 mi. Rapides Parish $18,003—to G. I. Nichols, Alexandria, 8.05 mi. Vernon Parish $28,879—to S. B. Boyd, Winnfield, gravel surfacing 8.2 mi. Winn Parish $26,709—to J. Lahaye, Ville Platte, 4.646 mi. Evangeline Parish $16,284—to Hennington Bros., Tallulah, 2.714 mi. East Carroll Parish $14,981; 9.065 mi. Sabine Parish $20,894 — to Erickson & Goudeau, Opelousas, 7.2 mi. St. Landry and Acadia Parishes $21,617—to Globe Constr. Co., Louisiana Bldg., New Orleans, 15.51 mi. Washington and St. Tammany Parishes $42,940—to R. N. Reynolds, Monroe, 6.42 mi. Jackson Parish $27,301, 6.169 mi. Richland Parish $25,767—to Savoy & Fontenot, Mamou, 5.019 mi. Evangeline Parish $19,983—to F. P. Jones, Leesville, 3 mi. Vernon Parish $16,087 — to F. D. Harvey & Co., Jonesboro, 5.512 mi. Madison Parish $26,532 — to Stafford Bros., Franklinton, 4.7 mi. Washington and St. Tammany Parishes $18,540—to W. R. Aldrich & Co., Dyersburg, Tenn., 6.5 mi. Evergreen-Jonesville Rd. $25,911; 7.08 mi. Barnett Rd. $27,856, both West Carroll Parish—to R. C. Webb Delta, 6.47 mi. Pioneer Rd., West Carroll Parish $20,891—to Halbert & Williams Co., Inc., Delhia, 4.583 mi. Franklin Parish $19,423—to Regan-hardt Constr. Co., Cape Girardeau, Mo., 2.017 mi. Grant Parish $9,415—to Goudeau & Guidry, Breaux Bridge, 4.7 mi. St. Martin Parish $24,552—to R. F. Merrill, Baton Rouge, 4.2 mi. West Carroll Parish $11,508—to Dixie Development Co., Alexandria, 6.948 mi. Route 24 $32,318; 6.172 mi. Route 716 and 717, $30,233, both Jefferson Davis Parish — to Long, Haggerty & Sullivan, Minden, 5 mi. Winn Parish $17,606; 3.295 mi. East Carroll Parish $15,492; 5.451 mi. Jackson Parish $17,237; local iron ore surfacing 4.9 mi. Sabine Parish $13,891—to Barber Bros. Constr. Co., Baton Rouge, shell surfacing 4.5 mi. St. Martin and Iberia Parishes $25,204; grading, drainage structures 5.156 mi. Lafayette and St. Martin Parishes $16,980—to Hunter & Drew, Minden, 6.316 mi. Lincoln and Jackson Parishes $24,191; 7.268 mi. Jackson Parish $35,727—to J. C. Neal, Hermitage, Ark., 6.525 mi. Lincoln and Union Parishes $34,601; 4.584 mi. La Salle Parish $18,830; 8 mi. Union Parish $18,639—to J. Newkirk, Farmerville, 9.226 mi. Union Parish $26,745—to W. H. Williams Arcadia, 4.48 mi. Lincoln and Bienville Parishes $15,466 —to Leathers & Martin, Alexandria, 6.2 mi. Webster Parish $18,357—to Guess & Albin, Jonesboro, 5.7 mi. Sabine Parish $21,063; washed gravel and local iron ore surfacing 2.45 mi. Natchitoches Parish $10,536—to J. J. McKeithen, Grayson, 6.979 mi. Caupti-Clear Lake Rd., $10,836; gravel surfacing 6.667 mi. Derry-Gorum Rd., $32,984, both Natchitoches Parish; sand and clay gravel surfacing 5.79 mi. Red River Parish $22,095 — to Forcum-James Co., Dyersburg, Tenn., grading, drainage structures 7.06 mi. Winn and Jackson Parishes $35,403; gravel surfacing 4.111 mi. Point Coupee Parish $21,997; 4.287 mi. Natchitoches Parish $15,828. Grand total $1,297,349. Noted Oct. 1.

La., Leesville—Vernon Parish, grading, drainage structures, gravel surfacing 11.5 mi. Project 817-A on Simpson-Sesper Hy., Route 3222, to Forgy, Hanson & McCorkle, Tallulah, $63,036.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 5.72 mi. hy. along Oldtown-Paw Paw Rd. from end Contr. A-87 at Oldtown to Town Creek, Contr. A-110-62, Allegany Co., to Thomas, Bennet & Hunter, Westminster, $85,980. Noted Oct. 29.

Mass., Boston—Dpt. P. Wks., A. W. Dean, engr., bituminous macadam paving 11,142 ft. Morton St., incl. steel, 3 hinged arch bridge, Dorchester Sect., to J. F. Kennedy & Co., 197 Sidney St., Cambridge, $382,199. Noted Oct. 22.

Mass., Cambridge—Street Dpt., sheet asphalt paving 52,000 ft., to John McCourt Co., 910 Huntington Ave., Boston. Est. $25,000.

Michigan — A. L. Burridge, div. engr., Cadillac, grading, drainage structures, concrete paving 2.559 mi. FO53-10C-1 Mason Co., for State Hy. Comn., Lansing, to Goldberg Constr. Co., Durand, $41,937. Noted Oct. 22.

Michigan—H. G. Oakes, div. engr., Plymouth, grading, lengthening drainage structures 9.911 mi. FO50-24C-1 and 2, Macomb Co., for State Hy. Comn., Lansing, to H. Campbell & Son, Port Huron, $46,155. Noted Oct. 22.

Mo., Clayton—St. Louis Co., reinf.-con. paving 12,125 ft. Lackland Ave., to Keeley Bros., 4301 State St., East St. Louis, Ill., $66,922; 2,215 ft. Lafayette St., to Independent Quarry & Constr. Co., 209 Missouri Bldg., $13,530.

N. J., New Brunswick—Middlesex Co., Court House, paving Woodbridge-Iselin-Oak Tree Rd., to Liddle & Pfeiffer, Perth Amboy, $24,617.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Pomonok Asphalt Paving Co., 1246 Grand St., asphalt paving East 39th St., $5,959—to Carbloc Paving Co., Stagg St., Elton St., $5,803, Greene Ave., $7,623—to B. Turecamo Contg. Co., New Cropsey Lane, Avenue P, $3,369; West 57th St., $6,942; 61st St. $5,850—to A. Suriano, foot 24th St., grading Nostrand Ave., $12,933—to W. J. Hale, 1250 Jefferson Ave., Kenmore Pl., $3,253; Harmon St., $3,384—to C.P.K. Co., Inc., granite block paving North 1st St., $26,559. Grand total $79,045. Noted Oct. 22.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading Barnes Ave., to A. Masero, 704 East 182nd St., $953; Edison Ave., to O. Mancini, $3,735. Noted Oct. 29.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, granite block paving Canal St., to Meehan Paving & Constr. Co., 90 West St., $25,935. Noted Nov. 2.

N. Y., St. George—J. Lynch, pres. Richmond Boro, Boro Hall, macadam paving Midland Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $9,931. Noted Oct. 15.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, grading Spring St., to Seaboard Constr. Co., 40 Rector St., New York, $5,173 — granite block paving South St., to J. Johnson Sons, 455 Bway., West New Brighton, $17,907—replacing stone Bowles Ave. and replacing cinders Armstrong Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $8,505 and $15,123 respectively. Grand total $46,908. Noted Oct. 29.

O., Canton — City, grading, concrete circle curb, stone for curb, brick paving 1 mi. Arnold Ave. between 12th and 19th St. N. W., 50 ft., to Garaux Bros. Co., 415 9th St. S. W., $34,322. Est. $40,000.

O., Cleveland—Cuyahoga Co., 104,150 sq.ft. stone sidewalks from Wolf to Clarke Rds., to Rieley Bros., The Arcade, $31,317. Est. $32,000.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 1.541 mi. Oklahoma Public Land Project I. P. S. Hy. 277, north of Lawton, 20 ft., Comanche Co., to Standard Paving Co., 2119 East 11th St., Tulsa, $33,862. Est. $40,000.

Okla., Tulsa—City Comrs., E. Logan, asst., removing part present paving, and grading, drainage structures, curbing, guttering, asphaltic binder course surfacing 2 blocks Street Impvt. Dist. 1091, 11th St., 53, 58 and 63 ft. wide, to H. L. Cannady Constr. Co., 116 South Lewis St., $25,618. Est. $26,007.

Pa., Crafton—Amiesite resurfacing Bradford Ave., and Station St., to Ben Constr. Co., Hargrove St., Pittsburgh. Est. $25,000.

Pa., Wittmer—Baltimore & Ohio R.R. Co., Baltimore, Md., H. A. Lane, ch. engr., grading required in relocating main line, to Yanz Constr. Co., Cumberland, Md. Est. $125,000.

Utah—State Hy. Comn., Salt Lake City, grading, graveling 4.304 mi. Lincoln Hy. between Paces Ranch and Kimballs Junction, Summit Co., to Reynolds-Ely Constr. Co., Springville, $32,960.

Washington—State Hy. Dpt., Olympia, grading, bridging 2.659 mi. Yakima Co., to Colonial Building Co., 205 Huron Bldg., Spokane, $35,451—stockpiling 13,300 cu.yd. crushed stone, Ellenburg to Yakima Detour, Kittitas and Yakima Counties, to I. L. Young, 523 Henry Bldg., Portland, Ore., $10,374—constructing bridge over Skokomish River, Mason Co., to West Coast Constr. Co., 1022 Lloyd Bldg., Seattle, $50,443—bridge over Wenatchee River, Chelan Co., to Puget Sound Bridge & Dredging Co., 2929 16th Ave. S.W., $114,814. Grand total $231,082. Noted Oct. 22.

Wyoming — State Hy. Comn., Capitol, Cheyenne, graveling 11.383 mi. Greybull-Lovell Rd., and 3.187 mi. Lovell-Cowley Rd., Big Horn Co., to Wilson & Welch Constr. Co., Casper, $12,363 and $19,523 respectively—8.499 mi. Johnson Co. and 62.771 mi. Natrona Co., to Western Bridge & Constr. Co., 3857 Leavenworth St., Omaha, Neb., $35,216 and $35,674 respectively. Grand total $102,776

Ontario—Dpt. Public Hys., Parliament Bldgs., Toronto, grading structures, culverts, ditching 4.6 mi. Middle Rd. Hy. from Toronto to Hamilton, Contr. 31-82, to W. G. Campbell Eng. & Contg. Co. Ltd., 142 Geoffrey St., Toronto. Est $30,000.

Ont., Toronto — East York Twp., asphalt paving several streets, to Rayner Constr. Co. Ltd., 159 Bay St., Toronto, $69,648. Noted Nov. 5, under "Contracts Awarded."

Ont., Toronto—York Twp., asphalt on concrete paving Roselawn Ave., to R. C. Huffman Constr. Co., 331 Bay St., $35,483.

Ont., Toronto—Asphalt paving Elmsthorpe Ave., to Constructing & Paving Co., Confederation Life Bldg., $6,692—bituithic paving Applegrove Ave., to Warren Bituminous Paving Co., 74 University Ave., $17,255—concrete paving lane near St. Clair, to Grant Contg. Co., 47 Wellington St. E., $504—lane near Shaw St., to L. P. Aeri, 28 Grove Ave., $1,171—concrete sidewalks, Foxbar Rd., to Dileo & Co., 239 Bellwoods Ave. Total est. $28,000.

Ont., Windsor—See "Waterworks."

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ont., Brantford — City, earth filling canal, $94,270. F. P. Adams, City Hall, engr.

BIDS ASKED

Ontario—See "Contracts Awarded."

Que., Hull—See "Contracts Awarded."

CONTRACTS AWARDED

Ala., Birmingham—See "Sewers."

Calif., Los Angeles—Flood Control Dist., Los Angeles Co., 202 North Bway., constructing earth levee Los Angeles River, from Orange St. to Pacific Electric R.R., Santa Ana River, incl. 66,000 cu.yd. earth levee, 7,000 lb. placing metal drainage culverts, 5,125 lin.ft. laying railroad track complete, 34,000 tons, furnishing, placing rock rip-rap exclusive of freight, to Merritt-Chapman & Scott, 720 Wilmington Ave., San Pedro, $41,661.

Ia., Burlington—City, R. Schlampp, clk., 230 ft. steel piling seawall, 42 ft. wharf, to Miller Constr. Co., 1205 Lucas Ave., $21,439.

N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., retaining wall, 138th to 141st Sts., to Lyons Slattery Co., 2432 Grand Concourse, $35,000.

Ontario—Federal Govt., K. M. Cameron, engr., Dpt. P. Wks., Ottawa, dredging at Belleville, $11,375, breakwater and harbor for seaplanes, Haileyburg, $67,000, day labor.

Que., Hull—City, retaining walls along Brewery Creek from Ottawa River to Aylmer Rd., day labor. $74,800. T. Lanctot, city engr.

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Bond Elections

Coming Bond Elections

Waterworks Tank, Deep Well, Pumps and Distribution Lines — Dixon, Mo. (election in spring), Western Eng. Co., Springfield, engrs. $40,000.

Wells, Pump, Tank and Distribution Lines — Everton, Mo. (election in spring), Western Eng. Co., Springfield, engrs. $20,000.

Waterworks — Red Granite, Wis., November. $35,000.

Waterworks and Sewers—Vancouver, B. C., Dec. 16, $600,000. C. B. Brackenridge, City Hall, engr.

Sewerage System—San Jacinto, Calif., $90,000.

Sewage Disposal Plant, Pumps and Waterworks Impvts.—Durant, Okla., Dec. 8, $50,000.

Bridge — Vancouver, B. C., Dec. 16. C. B. Brackenridge, City Hall, engr. $290,000.

Natural Gas Dist. System—Newton, Kan., Nov. 24. $300,000.

Park Impvts.—Whittier, Calif., D. E. Allen, clk. $285,000.

Court House — Mt. Clemens, Mich., Dec. 21, $250,000.

Bonds Voted

Waterworks—Ludlow, Ky., $120,000.

Water Supply—Versailles, Ky., $50,000.

Reservoir, 38 m.g. Cap. and Dam—Bedford, Pa. S. C. Hulse, consult. engr. $100,000.

Waterworks and Sewerage System — Glenfield, Pa. Kaltenbaugh & McClain, Glenfield, engrs. $50,000.

Waterworks and Hydro Electric Impvts.—Fairview, Utah, $30,000.

Waterworks Impvts.—Vernal, Utah, $50,000.

Sewage Disposal and Electric Light Plant — Shelby, O. $185,000 and $85,000.

Sewers—Westview and Millvale Boros., Ross and Shaler Twps., Pa. $200,000. McCully Engr. Co., Berger Bldg., Pittsburg, F. G. Ross, 3509 Fourth Ave., Pittsburg, engrs.

Sewerage System—Lansing, Mich., $500,000.

Natural Gas Dist. System — Owensboro, Ky., $200,000.

Bonds Defeated

Waterworks Ext.—Canton, O. $145,000.

Water Supply Add.—Watertown, S. D. $190,000.

Sewage Disposal Plant—Bedford, O. $175,000.

Storm and Sanitary Sewers — Canton, O. $421,000.

Sewage Plant—East Palestine, O. $26,000.

Drainage System—Conshohocken, Pa. $28,000.

Bridge—Rye, N. Y. $80,000.

Dam—Chambersburg, Pa. $250,000.

Parks and Playgrounds—Norwood, O. $100,000.

Schools—San Francisco, Calif., City and County, $3,500,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Porterville—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., post office, $150,000. Architect not appointed.

Calif., Visalia—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans post office, $150,000. Architect not appointed.

Idaho, Weiser—FEDERAL BUILDING—Treas. Dpt. at office Sup. Archt., sketches by Tourtellotte & Hummell, Boise, federal building, $110,000. Noted June 25.

Mass., Fall River—DREDGING—U. S. Eng., additional dredging in Fall River Harbor, $25,000. Private plans.

Minn., Hastings—CLEARING—U. S. Eng., 615 Commerce Bldg., St. Paul, returned bids unopened clearing 5,139 acres land in pool area above Mississippi River. New bids may be taken later. Noted Oct. 22.

Minn., Hastings—MARKERS—U. S. Eng., 615 Commerce Bldg., St. Paul, furnishing, installing channel markers on concrete piers about 1 mi. apart in Mississippi River from here north, $17,500.

N. J., Fort Monmouth—ADMINISTRATION OFFICE, etc.—Con. Q. M., Fort Monmouth, 3 story, basement, brick, steel administration office, field signal school, $750,000; 3 story, basement, brick, steel radio laboratory, $275,000. **Maturity indefinite.**

N. J., Fort Hancock—THEATRE—Con. Q.M., Fort Hancock, 1 story, basement, brick, steel theatre, $150,000. Private plans.

N. Y., Brooklyn—ALARM SYSTEM—Spec. 6661—Yards & Docks, Navy Dpt., Wash., D. C., rejected bids Sept. 30, water flow alarm system, at Naval Supply Depot. Noted Sept. 17.

N. C., Wadesboro—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., post office, $95,000.

Pa., Ambridge—POST OFFICE—Treas. Dpt. at Office Sup. Archt., Wash., D. C., plans by Carlisle & Sharrer, 415 Martin Bldg., Pittsburg, Pa., and R. M. Trimble, consult., archt., Commonwealth Bldg., Pittsburgh, U. S. Post Office. Noted Sept. 10.

Tenn., Nashville — POST OFFICE — Treas. Dpt. at office Sup. Archt., plans by Marr & Holman, Stahlman Bldg., post office, Broad and 9th Sts. Noted Jan. 8.

Tex., Sabine Pass—QUARANTINE STATION—Treas. Dpt. at office Sup. Archt., Wash., D. C., 2 and 3 story, rein.-con., brick, steel, $375,000. Noted Jan. 23.

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Utah, Bingham Canyon — POST OFFICE — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Scott & Welch, Dooly Bldg., Salt Lake City, U. S. Post Office.

Utah, Tooele—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by M. E. Miller, Boston Bldg., Salt Lake City, U. S. Post Office. Noted June 11.

Wyoming—BRIDGE—Pub. Rds., Denver, Colo., bids early in 1932, 40 ft. span spandrel filled arch bridge on Project 1-G-3; reconstructing viaduct, grading 0.975 mi. tunnel, Project 1-A-4, both on Grand Loop Hy., Yellowstone Park. A. E. Palen, Custom House, Denver, Colo., engr.

BIDS ASKED

Calif., Sacramento—DREDGING—U. S. Eng. taking bids dredging 4,840,700 cu.yd. in San Joaquin River. Noted Nov. 12.

D. C., Wash.—HAMMERS, etc.—Dec. 1, by Bureau Supplies & Accounts, Navy Dpt., 2 pneumatic hammers, chipping, heavy work, Type B.

D. C., Wash.—LABORATORY—Nov. 25, by Yards & Docks, Navy Dpt., 3 story, basement, 61 x 128 ft., brick extension at Naval Research Laboratory, at Bellevue.

Fla., Jacksonville — JETTIES — U. S. Eng. taking bids repairing north and south jetties at entrance to St. John's River, incl. 70,000 tons stone.

Fla., Miami—QUARANTINE STATION—Dec. 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Quarantine Station Building; adv. E. N.-R. Nov. 19.

Illinois—LEVEE—Dec. 2, by U. S. Eng., 428 Customhouse, St. Louis, Mo., 128,000 cu.yd. earthwork by hydraulic methods for rebuilding, enlarging levee in Lost Creek Drainage & Levee Dist., Cass Co.; adv. E. N.-R. Nov. 19.

Ill., Cairo—PILING DIKES—Nov. 24, by U. S. Eng., 428 Customhouse, St. Louis, Mo., 4,000 lin.ft. piling dikes in Mississippi River at Rockwood and Crain Island, above here; adv. E. N.-R. Nov. 19. Noted Nov. 12.

Ia., Knoxville—WATER SOFTENING PLANT—Dec. 1, by Vet. Bu., Arlington Bldg., Wash., D. C., zeolite water softening system, incl. housing at Veterans Administration Hospital. Noted Nov. 12.

La., Harvey—FIXED IRONS, etc.—Dec. 15, by U. S. Eng., 1st New Orleans Dist., Poland and Dauphine Sts., New Orleans, furnishing, setting, erecting fixed irons, gates and operating machinery for lock in Louisiana nad Texas Intracoastal Waterway, near here; adv. E. N.-R. Nov. 19.

La., Shreveport—KITCHEN EQUIPMENT—Nov. 30, by Con. Q. M. Office, Barksdale Field, constructing, installing kitchen equipment in air corps barracks at Barksdale Field; adv. E. N.-R. Nov. 19.

Mass., Bedford—HOSPITAL—Dec. 22, by Vet. Bu., Arlington Bldg., Wash., D. C., infirmary, apartments, at U. S. Veterans' Hospital. Private plans. Noted Feb. 26.

Missouri—DIKES—Nov. 24, by U. S. Eng., 428 Customhouse, St. Louis, 1,200 lin.ft. batter pile dikes in Missouri River at Lower Bonhomme Bend; adv. E. N.-R., Nov. 19.

Mo., Springfield—HOSPITAL—Nov. 23 (extended date), by Treas. Dpt., at office Sup. Archt., Wash., D. C., main building, acute building, continued treatment building, mess halls, kitchen and auditorium storehouse and bakery building, laundry, meter house, near Sunshine Rd., pipe tunnel to tuberculosis building for hospital for defective delinquents for Dpt. Justice, $1,800,000. Noted Oct. 29.

Nev., Boulder City—GARGAE—Nov. 23, by Bureau Reclamation, Denver, Colo., 1 story, 71 x 151 ft., rein.-con. garage, concrete found., for Boulder Canyon Project, Arizona-California-Nevada.

N. H., Portsmouth—TRACTOR—Nov. 24, by Div. Supplies & Accounts, Navy Dpt., Wash., D. C., 1 motor driven tractor. Schedule 6883.

N. J., Princeton—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Dec. 15, general contract 2 story, basement, brick, steel post office, $150,000. C. Z. Klauder, 1429 Walnut St., Phila., Pa., archt.

N. Y., Brooklyn—WIRE—Dec. 1, by Signal Supply Office, Army Base, 58th St. and 1st Ave., wire.

N. Y., New York—DREDGING—Dec. 16, by U. S. Eng. Army Bldg., 39 Whitehall St., 15,500 cu.yd. materials other than ledge rock and removing 59,530 cu.yd. ledge rock in Middle Ground, East River; adv. E. N.-R. Nov. 19. Noted Nov. 12.

North Carolina—DREDGING—Dec. 15, by U. S. Eng., Wilmington, 67,680 cu.yd. rock and soft materials, in Sect. 2, and 88,700 cu.yd. soft materials in Sects. 1 and 2, Intracoastal Waterway, Beaufort to Cape Fear River; adv. E. N.-R. Nov. 19. Noted Oct. 29.

O., Newark — POST OFFICE — Dec. 7, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office.

Oregon — EARTHWORK — Dec. 23, by Bureau Reclamation, Nyssa, earthwork tunnels, structures, North Canal, (Owyhee River Siphon) Mitchell Butte Division, Owyhee Project, Oregon-Idaho, near Nyssa and Adrian, Ore.; adv. E. N.-R. Nov. 19.

Pa., Beaver—LOCK—U. S. Eng., Pittsburgh, taking bids lock at 3rd. fixed dam at Montgomery, Ohio River, 6 mi. below here.

Pa., Pittsburgh — POWER HOUSE — U. S. Eng., taking bids power house, administration building on founds. at Lock 4, Monongahela River.

Tenn., Elizabethtown—POST OFFICE—Dec. 11, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Nov. 19.

Tenn., Rogersville—POST OFFICE—Dec. 3, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office.

Tex., Mercedes—CITRUS LABORATORY—Dept. Agriculture, Wash., D. C., taking bids, brick, rein.-con., at Texas Experiment Sta., between Mercedes and Weslaco. Noted Sept. 1

Tex., Plainview—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Jan. 1, general contract U. S. Post Office, $152,000. Noted July 2.

Va., Bristol — POST OFFICE — Dec. 9, Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E. N.-R. Nov. 19.

CONTRACTS AWARDED

Ark., North Little Rock—CLINICAL BUILDING—Vet. Bu., Arlington Bldg., Wash., D. C., 4 story basement, 40 x 127 ft. and 44 x 112 ft. with 36 x 50 ft. wing, brick, steel, reinforced at U. S. Veterans' Hospital, Fort Root, to Peterson, 1121 Donaghey Bldg., Little Rock, $183,250. Noted Sept. 24.

D. C., Wash.—SUPREME COURT BUILDING—At office S. Lynn, archt. Capitol 3 story basement, central portion, 3 story, basement sides, marble, to G. A. Fuller, Munsey Bldg., $8,383,000. Noted Sept. 24.

Fla., Miami—LIGHTING—Spec. 6673—Yards & Docks, Navy Dpt., Wash., D. C., lighting landing fields, to W. Hepburn & Co., Real Bank Bldg., Miami, $10,130.

Fla., Miami — POST OFFICE, etc. — Treas. Dpt. at office Sup. Archt., Wash., D. C., modeling, enlarging U. S. Post Office and Custom House, to Smythe & Co., 1416 F St. N. W., Wash., D. C., $19,345. Noted Oct. 22.

Ga., Fort Benning—DISTRIBUTION SYSTEM—Con. Q.M. electrical distribution system in 6 houses in hospital, group, to Mill & Main Electric, Inc., Gastonia, N. C. $8,470. Noted Oct. 15.

Ill., Aurora—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to H. G. Christman, South Bend, Ind., $210,000. Noted Oct. 22.

Ill., Chicago—CONTROL HOUSES—U. S. Eng., 333 North Michigan Ave., 3 brick control houses for locks on Illinois River at Lockport, Marseilles and Starved Rock, to Schmidt Bros. Constr. Co., 22 East Huron St., $37,825. Noted Oct. 22.

Ia., Albia—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Anderson & Co., 1632 West 75th St., Chicago, Ill. $55,000. This corrects report in Nov. 5 issue.

Kan., Ottawa—REMODELING, etc.—Treas. Dpt. at office Sup. Archt., Wash., D. C., to modeling, enlarging U. S. Post Office, to M. R. Stauffer, Newton, $14,998. Noted Oct. 22.

Ky., Bowman Field—HANGAR, etc.—Con. Q. M. double hangar, boiler house, to Thomas Harmon Eng. Co., 844 Rush St., Chicago, Ill., $55,770. Noted Oct. 22.

Miss., Aberdeen—POST OFFICE and FEDERAL COURT—Treas. Dpt. at office Sup. Archt., extending, remodeling 2 story, basement 45 x 73 ft., concrete, brick, stone, to A. Blair, 1st Natl. Bank Bldg., Montgomery, Ala. $73,960. Noted Oct. 22.

Nev., Boulder City—MUNICIPAL—Bureau Reclamation, Denver, Colo., administration, municipal and dormitory buildings, to B. O. Siegfus, 1135 Westminster Ave., Salt Lake City, Utah. $46,253. Noted July 30.

N. Y., Brooklyn—FIRE ALARM SYSTEM—Treas. Dpt. at office Sup. Archt., Wash., D. C., fire alarm system at U. S. Post Office to Greer Electric Co. Constr. Co., 205 East 42nd St., New York, $2,906. Noted Sept. 24.

N. Y., Trout River—INSPECTION STATION—Treas. Dpt. at office Sup. Archt., U. S. Inspection Station, to Salem Constr. Co., Salem, Mass., $40,500. Noted Oct. 29.

N. C., Greensboro—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to G. H. Rommel Co., 958 Logan St., Louisville, Ky., $569,000. Noted Oct. 8.

Okla., Fort Sill — ROADWAY — Con. Q.M. concrete paving 4.733 mi. Fort Sill Rd., 20 ft., Comanche Co., to Standard Paving Co., 2119 East 11th St., Tulsa, $113,812. Est. $125,000. Noted Sept. 17.

Tenn., Chattanooga—TEST BORINGS—U. S. Eng., diamond core drilling on 11 prospective dam and lock sites, on Tennessee River between Riverton and Wilson Dam, and Chattanooga and Knoxville, to Osborne Drilling Co., 70 East 45th St., New York, $18,439.

Tenn., Memphis — PORTLAND CEMENT — U. S. Eng., 60,000 bbl. portland cement, to Marquette Cement Mfg. Co., U and P Bank Bldg., $78,000; 150,000 lb. ½ in. strand wire to Broderick & Bascom Rope Co., 4203 North Union Blvd., St. Louis, Mo., $5,310; 600,000 lb. ¾ wire and 75,000 lb. ½ in. wire at $18,960 and $3,000 respectively. Grand total $105,270.

Va., Langley Field—FUELING SYSTEM—Con. Q.M., gasoline fueling system, to Aqua Systems, Inc., 2 Lafayette St., New York, $19,518. Noted Sept. 17.

Va., Langley Field—WAREHOUSES—Con. Q. M., two 1 story, 100 x 341 ft. air corps warehouses, to Smith-Pew Constr. Co., 435 Irwon St. N. E., Atlanta, Ga., $97,188. Noted Oct. 22.

Wash., Pasco—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Hedden Constr. Co., Amer. Bank Bldg., Seattle, $56,700. Noted Oct. 1.

W. Va., Huntington—GUIDE WALLS—U. S. Eng., increasing height of lower guide walls Ohio River Locks, to Dravo Contg. Co., Neville Island, Pittsburgh, Pa., $23,470. Noted Sept. 10.

Federal Government (Continued)

Canal Zone — QUARTERS — Dpt. Quartermaster P. C. Dpt., Quarry Heights, 2 field officers, 5 company officers, 2 non-commissioned officers and 4 family officers quarters, 1 barrack, sewers, storm drainage, water distribution, fire protection, roads, curbing, walks at Fort Davis, to H. B. Nelson Constr. Co., Columbus, Ga., $254,870. Noted July 30.

FEDERAL POWER COMMISSION

Applications for License and Permits

Licenses

1177—San Diego Consolidated Gas & Electric Co., San Diego, Calif., wants license constructed transmission line in San Diego Co. effecting lands within Cleveland Natl. Forest.

1178 — E. I. Fraser, Coulterville, wants license power project on North Fork, Merced River within Stanislaus Natl. Forest, Mariposa Co.

1179—R. W. Richards, Jr., Rockport, Ind., wants preliminary permit power project on Rough River, in Ohio, Grayson and Breckenridge Counties, Ky.

RAILWAYS

PROPOSED WORK

Maryland—Pennsylvania R.R., E. B. Temple, ch. engr. (Eastern Region), Phila., Pa., soon lets contracts relocating 3 mi. tracks, constructing passenger station, bridge over Little Elk Creek an one over Carroll Branch, in Elkton.

Washington—Bd. P. Wks., Seattle, bids after Jan. 1, municipal street railway track construction as part University Bridge improvement program in Seattle. T. D. Hunt, Seattle, city engr.

CONTRACTS AWARDED

New York—See "Bridges, under New York, N. Y."

SUBWAYS AND TUNNELS

PROPOSED WORK

Que., Montreal—City and Dominion Govt., 1,200 ft. rein.-con. subway, 80 ft. wide, under Lachine Canal, at Briand St. J. Leroux, 403 City Hall, engr. bridges and tunnels.

CONTRACTS AWARDED

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., plans completed and funds appropriated, bids early in summer, 6th Avenue Subway from 4th to 53rd Sts., $30,000,000. Project held up at request Bd. Water Supply, pending completion of aqueduct.

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., plans 32 mi. track for subway under 2nd Ave. from Houston St. to Harlem River, incl. 4 tracks to 61st St., 7 tracks to 125th St. and 4 tracks to Harlem River. Plans for test borings in progress. **Project will mature after February.** Funds available when needed. $87,600,000.

Pa., Phila.—Dpt. City Transit, C. E. Myers, dir., City Hall Annex, Contr. 333, installing 350 gross tons contact rail, furnishing, installing track bonding, Ridge Ave. and 8th St., West Philadelphia Branch Broad St. Subway, to Kaufman Constr. Co., 26 South 15th St., $15,990. Noted Oct. 29.

GRADE CROSSINGS

PROPOSED WORK

Tex., Fort Worth—Agreement between City, Texas & Pacific R.R., E. F. Mitchell, Dallas, ch. engr. and St. Louis, San Francisco R.R., F. G. Jonah, St. Louis, Mo., ch. engr., soon take bids building 3 viaducts at West Daggett Ave., Ballinger St. and Summit Ave., and lowering of grades of both railways from Henderson St., to a point several hundred feet west of Summit Ave. Total est., $1,000,000. G. Fairtrace, Forth Worth, mayor.

CONTRACTS AWARDED

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, 2 pedestrian underpasses, MO41-31C-2, Kent Co., to Owen-Ames-Kimball Co., Grand Rapids, $12,527. Noted Oct. 22.

DAMS

BIDS ASKED

Tex., Rusk—See "Waterworks."

Que., Temiskaming—See "Contracts Awarded."

CONTRACTS AWARDED

Que., Temiskaming—Federal Govt., K. M. Cameron, engr. Dpt. P. Wks., Ottawa, Ont., dam, day labor. $75,000.

PIERS AND WHARVES

PROPOSED WORK

Mass., Barnstable—PIER, etc.—W. P. Whittemore, Centerville, timber pier, bulkhead, fill solid, Centerville River. $25,000. Private plans.

CONTRACTS AWARDED

Ia., Burlington—WHARF—See "Excavation, drainage, Irrigation, Levees, River and Harbor."

N. Y., New York—PIER—J. McKenzie, comr. Docks, Pier A, Battery Pl., building Pier 9, foot Old Slip, East River, Contr. 2042, to J. Richard Steers, 17 Battery Pl., $335,475. Noted Oct. 29.

AIRPORTS

PROPOSED WORK

Calif., San Gabriel—Eastern Airplane Mfg. Co. plans by National Airport Eng. Co., 775 East Washington St., 3 concrete, brick, steel buildings, 120,000 sq.ft. floor space.

BIDS ASKED

Tex., Beaumont—City, c/o P. Millard, mayor, taking bids 60 x 120 ft., steel hangar, 24 ft. high inside, $30,000. Irby & Woodside, 1020 Goodhue Bldg., archts. R. C. Black, city engr.

POWER AND LIGHTING

PROPOSED WORK

Kansas—Kansas Pipe Line & Gas Co., Salina, surveys natural gas distribution systems in town of Belpre, Beverly, Bushton, Claflin, Delphos, Holyrood, Macksville, Miltonvale, Seward and Tescott. Gas will be secured from 26 in. line now being built from by Missouri Valley Pipe Line Co. between Mullinville and Clifton.

New York—Elmira Water Light & R.R. Co., Elmira, gas plant extensions and distribution facilities in Erwin, Chemung, Veteran, Baldwin, Ashland, Elmira, Cayuta, Hector and Odessa. Project awaiting approval Pub. Serv. Comn.

New York—New York State Electric & Gas Corp., 22 Central Ave., Ithaca, gas plant and extensions in Freeville, Danville and Van Etten.

New York—Northern New York Utilities, Inc., 58 Public Sq., Watertown, electric distribution system in Rodman and Pamelia, Jefferson Co.

N. Y., Silver Lake — New York Central Electric Corp., 89 East St., Rochester, electric distribution system.

Que., Montreal East—Town Council, installing fire alarm and police signal systems.

BIDS ASKED

Ill., New Minden—See "Contracts Awarded."

Ill., Ozark—See "Contracts Awarded."

New York—See "Contracts Awarded."

Tex., Borger—City, c/o J. R. Miller, mayor, taking bids municipal gas system (incl. plant, distribution system) to supplant system now owned and operated by Panhandle Power & Light Co. City signed contract with J. H. Huber Petroleum Co. to furnish gas.

CONTRACTS AWARDED

Calif., Los Angeles—City Council, ornamental lighting system in La Brea Ave. between Washington and Exposition Blvds., to W. H. Rumble, 6507 Haas Ave., $28,881.

Ill., New Minden—Illinois Commerce Comn. authorized the Illinois Power & Light Corp., 9th and Adams Sts., Springfield, to construct and operate 6,900 volt electric line to and in New Minden, own forces.

Ill., Ozark—Illinois Commerce Comn. authorized the Central Illinois Pub. Serv. Co., 407 East Adams St., Springfield, to construct and operate 6,900-11,940 volt electric power transmission line from present line to and in Ozark, own forces.

New York—Niagara Hudson Power Co., 15 Broad St., New York, 75 mi. superpower transmission line between New York and Albany, day labor and separate contracts. $7,500,000. Noted Mar. 19.

Pa., Scranton—Scranton Electric Co., underground transmission line, to J. T. Sweeney and H. B. Sproul, Scranton. Est. $800,000.

Tex., Borger—See "Bids Asked."

PARKS AND SPORTS

PROPOSED WORK

Mass., Provincetown—Cape Cod Outings Co., T. W. Taylor, 8 Newbury St., Boston, sketches by H. B. Alden, 126 State St., Boston, recreational and outing center, near town pier, incl. brick, steel casino, concrete outdoor swimming pool, 10 acre athletic field. $750,000 funds being raised for same.

N. J., Avon-by-the-Sea — Bd. City Comrs. sketches by J. W. Baker, 111 North 4th St., Harrison, 1 story, basement, brick, steel bathing group. $150,000. Noted Oct. 22.

N. Y., Port Richmond—Staten Island Baseball Club, c/o M. T. Gordon, Jr., 735 Richmond Rd., 1 story, steel, concrete ball park and stadium. Project indefinitely in abeyance. Noted Oct. 22.

Tex., San Antonio—City, c/o C. M. Chambers, mayor, municipal park improvements, incl. some new playground equipment, concrete swimming pool, athletic courts, buildings, general improvements. $650,000 bond issue validated. I. Ewig, city engr. Noted Oct. 29.

Que., Three Rivers—City Council, rein.-con. brick public bath. $150,000.

BIDS ASKED

Conn., Brookfield—See "Contracts Awarded."

N. Y., Brooklyn—Nov. 24, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, developing McKinley Park, 73rd St., Fort Hamilton Parkway and 7th Ave.; improving City Park, Park and Flushing Aves., St. Edwards and Navy Sts., Brooklyn Boro.

N. Y., New York—Corporation, c/o Shampan & Shampan, archts., 188 Montague St., Brooklyn, taking bids on separate contracts amusement and athletic park, Bronxdale, Niel and Barnes Aves. and Boston & Westchester Ry tracks. $200,000.

Pa., Slippery Rock—Nov. 25, by State Teachers College, swimming pool, shower and locker room. $40,000. W. G. Eckles Co., 223 East Washington St., New Castle, archt. G. T. Titzel, Butler County Natl. Bank Bldg., Butler, engr.

CONTRACTS AWARDED

Conn., Brookfield—Candlewood Lake Club, c/o Robert E. Farley Organization, 342 Madison Ave., New York, 1st section golf course and park development, Candlewood Lake, separate contracts. To exceed $40,000. Additional development contemplated.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, improving playgrounds at P.S. 98 and P.S. 189, to B. C. and F. Contg. Co., 108 22nd Ave., Corona, $10,981 and $12,995 respectively. Noted Sept. 3.

N. Y., New York—Bd. Educ., 500 Park Ave., general contract Evander Childs High School Athletic Field House, to Jerome Constr. Co., 1924 Washington Ave., $63,698; heating, to Roxy Plumbing & Heating Co., 155 East 28th St., $3,050; plumbing, to P. R. Tully, 403 East 105th St., $9,850; bleacher stands, to Globe Iron Wks., 355 Walton Ave., $17,970. Grand total $94,568. Noted Oct. 22.

N. Y., New York—Park Bd., W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, repairing sheet asphalt and concrete parkway and park roads, drainage system, in Rice Memorial Playfield, Pelham Bay Park, to Modern Plumbing Corp., 1860 Bway., $48,500. Noted Nov. 5.

HEATING AND VENTILATING

BIDS ASKED

Ind., Evansville—See "Contracts Awarded."

N. J., Passaic—J. T. Caulet, archt., 26 Picket Ave., Clifton, taking bids heating system for Church, Amory Park, for St. Peter's and St. Paul's Polish Natl. Church. $25,000.

N. Y., Auburn—Dec. 1 (extended date), by Commissioner Correction, State Office Bldg., Albany, heating, sanitary work, kitchen equipment, bakery oven, machinery, etc., new Mess Hall, Kitchen and Bakery Building, at Auburn Prison; adv. E.N.-R., Nov. 19. Noted Oct. 29.

N. Y., Brooklyn—Nov. 23, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, drainage, electrical work and lighting fixtures in P. S. 236, Avenue U from East 63rd to East 64th Sts., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

Ind., Evansville—G. Koch, 2112 Pennsylvania St., steam heating plant, plumbing system, electrical work at factory, 1015 West Ohio St., separate contracts. $25,000. Private plans.

Mass., Palmer — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 3 water tube boilers at Monson State Hospital, to Erie City Iron Wks., 25 Huntington Ave., Boston, $20,223; 3 underfeed stokers, to Westinghouse Electric & Mfg. Co., 10 High St., Boston, $10,831.

N. Y., Dannemora — Dpt. Correction, State Office Bldg., Albany, heating and service connections at Clinton Prison, to Afco Eng. Corp., 142 Fulton St., New York, $22,183; electrical work, to O'Connell Electric Co., 63 Mount Hope Ave., Rochester, $30,695; tunnels, to Fisher Contg. Co., 77 Rose St., Hastings-on-Hudson, $15,612. Grand total $68,490.

Pa., Phila.—Philadelphia Steam Co., 49th St. and Grays Ave., subsidiary Philadelphia Electric Co., 1000 Chestnut St. and United Gas Improv. Co., 1401 Arch St., steam mains and heat supply extensions, day labor or through its subsidiary company, United Engineers & Constructors, Inc., 112 North Broad St. Est. $4,000,000.

UNCLASSIFIED

PROPOSED WORK

Ind., Vincennes—EMBELLISHMENT—George Rogers Clark Sesquicentennial Comn., at office W. E. Parsons, archts., 80 East Jackson St., Chicago, Ill., soon takes bids embellishments for approach to memorial bridge and erecting stone terraces. $140,000. Noted July 23.

La., New Orleans—MARKET—City plans by Sam Stone, Jr. & Co., Masonic Temple Bldg., market. $50,000.

Mass., Cambridge—OBSERVATION STATION—Harvard University, H. Shepley, in charge, sketches by Coolidge, Shepley, Bulfinch & Abbott Ames Bldg., Boston, astronomical observation station, Oak Ridge. $25,000 or more.

Michigan—PIPE LINE—Old Dutch Refining Co., Muskegon, 85 mi. 6 in. oil pipe line between Mt. Pleasant and Muskegon, to handle 4,000 bbl. crude oil daily. $250,000. Private plans.

N. J., Beemerville—BARNS, etc.—James Turner Institute for Animal Research, reconstructing barns, stables, destroyed by fire. To exceed $70,000. **Maturity indefinite.**

N. J., West Orange—MEMORIAL—Edison Memorial Comn., W. J. Orchard, chn., Maplewood, tentative plans memorial, incl. permanent light, on Orange Mountain, Eagle Rock. $1,000,000-$3,000,000. Funds to be raised by public subscription.

New York — DISTRIBUTION SYSTEM — Townshore Heating Corp., c/o J. C. Robbins, Babylon, fuel oil distribution system in Islip, Bay Shore, Sayville.

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Unclassified (Continued)

Pa., Beaver—SUB-DIVISION—Dwight Allison, College Ave., laying out new sub-division, incl. new roads. Pitkin & Mott, 3866 Carnegie Ave., Cleveland, O., archts. and engrs.

Tex., San Antonio—LAND DEVELOPMENT—Jefferson Manor Co., c/o L. E. Fite & Co., 317 West Travis St., and N. S. Dickinson, Woodlawn Pl., developing 100 acre sub-division, Woodlawn Hills Sect., incl. gas, water and sewer mains and lights, telephone, grading and graveling streets. Private plans. ●

BIDS ASKED

Minn., St. Paul—ELEVATORS, etc.—Nov. 24, by Advisory Court House and City Hall Comm., C. P. Herbert, secy., Athletic Club Bldg., Cedar and 4th Sts., passenger and freight elevators in city hall and court house (now under construction), 4th and Wabasha Sts. Ellerbe & Co., 525 Minnesota Bldg., engrs. and archts.

N. Y., Elmira—ELEVATOR—Dec. 1, by Commissioner Dpt. Correction, State Office Bldg., Albany, electric elevator in Hospital building, New York State Reformatory.

N. Y., Ogdensburg—ELEVATOR—Dec. 2, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, elevator and dumbwaiters, Central Kitchen and Ward Buildings, St. Lawrence State Hospital; adv. E. N.-R. Nov. 19.

Ont., Toronto—GRADING—See "Contracts Awarded."

CONTRACTS AWARDED

Illinois, Texas and Wisconsin—PIPE LINE—Cities Serv. Co., 60 Wall St., New York, Texas Co., 17 Battery Pl., New York, Standard Oil Company of New Jersey, 26 Bway., New York, and Middle West Utilities Co., 170 mi. natural gas pipe line from Genesee, Ill., to Milwaukee, Wis., to Continental Constr. Co., 20 North Wacker Dr., Chicago, Ill. Contractor soon lets separate contracts.

Mo., St. Louis—MARKET—Bd. P. Serv., City Hall, general contract 1 story, 72 x 194 ft., rein.-con., steel market incl. boiler room, 34 x 110 ft. shelter platform, and 30 x 100 ft. open platform, to Kaplan & McGowan Co., Franklin-Amer. Trust Bldg., $99,246. Noted Oct. 8.

N. Y., Rockaway—PLUMBING—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, New York, plumbing in bathing pavilion, Jacob Riis Park, to F. Mascalli, $21,658.

Ont., Owen Sound—REVETMENT WALL—N. Desjardines, secy. Dpt. P. Wks., Ottawa, 300 ft. revetment wall on east side harbor, to Thunder Bay Harbor Impvt. Co. Ltd., Port Arthur, $26,200.

Ont., Toronto—GRADING—City, grading, incl. earth fill, levelling Lake Shore Park, day labor, $37,000. R. C. Harris, City Hall, engr.

MATERIALS

BIDS ASKED

CAST IRON PIPE and FITTINGS — **Brea, Calif.**—Dec. 2, by G. L. May, city clk., 10,000 ft. 4 in. Class 150 (B) and 3,500 ft. 6 in. Class 150 (B) c.i. pipe, miscellaneous fittings.

CEMENT—**Iowa**—Nov. 24, by State Hy. Comm., Ames, 1,000,000 bbl. cement at various destinations. C. R. Jones, aud.

EXPANSION JOINTS—**Iowa**—Nov. 24, by State Hy. Comm., Ames, 3,000 pieces 1 x 8 in. x 9 ft. expansion joints delivered in car lot to Ames.

BRIDGE LUMBER, etc.—**Audubon, Ia.**—Nov. 25, at office Auditor Audubon Co., 5,320 lin.ft. creosoted yellow pine piling, 25,000 ft. B.M. creosoted yellow pine bridge lumber, 160,000 B.M. Douglas fir bridge lumber, 2,900 lin.ft. corrugated culvert material, miscellaneous bridge hardware and paint. Address County Engineer or Auditor Audubon.

CULVERT PIPE, etc.—**Centerville, Ia.**—Nov. 24, at office Auditor Appanoose Co., corrugated culvert pipe, standard sawed fir bridge lumber, full sawed creosoted bridge lumber, creosoted piling, paint, hardware, and triple I-beam span. Address County Engineer or Auditor.

LUMBER, etc.—**Corning, Ia.**—Nov. 23, at office Auditor Adams Co., 163,000 ft. fir lumber, 3,280 lin. ft. creosoted yellow pine piling, 7,000 tons concrete mix, 1,200 bbl. cement, 70,000 sq.ft. mesh, 4,500 lb. nails, bolts, washers. Address County Engineer or Auditor.

BRIDGE LUMBER—**Osceola, Ia.**—Nov. 24, at office Auditor Clarke Co., 147,000 ft. B.M. untreated; and 30,900 ft. B.M. creosoted bridge lumber, 2,000 lin. ft. creosoted piling. Address County Engineer or Auditor, Osceola.

STONE—**Maine**—Nov. 24, by State Hy. Dpt., Augusta, furnishing, hauling stone as specified to Casco and Portland, $5,000 or more.

BITUMINOUS CONCRETE—**St. George, N. Y.**—Nov. 25, by J. A. Lynch, pres. Richmond Boro. Boro Hall, 300 tons bituminous concrete in Dists. 1, 2 and 3.

PAVING BRICK, etc.—**East Cleveland, O.**—Nov. 23, by City, paving brick, cement, sand and rock asphalt.

CAST IRON PIPE, etc.—**Memphis, Tenn.**—Nov. 25, by Bd. Water Comrs., Water Dpt., 3,225 lin.ft. 30 in. Class B, 7,775 lin.ft. 24 in. Class B or C c.i. pipe, two 50 in. and five 24 in. hub and water main gate valves with bevel gears and bypass. J. Sheehan, genl. supt.

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WATER PIPE—**Brighouse, B. C.**—Dec. 7, by Council Richmond Municipality, 5 mi. 12 in. steel water pipe.

CONTRACTS AWARDED

PIPE — **Fair Oaks, Calif.** — G. L. Camden, secy. Fair Oaks Irrigation Dist., 2,000 ft. 30 in. ten-gage riveted or welded steel slip joint soil proof pipe, to Western Pipe & Steel Co., 444 Market St., San Francisco, at $0.03 per ft.; furnishing (at ditch) 1,500 ft. 12 in. 12-gage welded or riveted steel slip joint soil proofed pipe, to W. B. and E. T. Shaw, Sacramento, at $0.94 per ft. Noted Oct. 29.

COPPER TUBING — **Oakland, Calif.**—Bd. Directors East Bay Municipal Utility Dist., 50,000 ft. ¾ in. seamless copper tubing, to Oakland Plumbing Co., 4th and Harrison Sts., $5,210.

WATER PIPE—**Denver, Colo.**—For 1,300 tons 6- to 24-in. mono cast bell and spigot pipe for Waterworks Dpt., to American Cast Iron Pipe Co., 2930 North 16th St., Birmingham, Ala.

LUMBER and PILING—**Atlantic, Ia.**—Cass Co., 324,419 B. F. untreated fir lumber, 106,667 B.F. creosoted fir lumber, 12,400 lin. ft. creosoted piling, to Atlantic Lumber & Coal Co., Atlantic, $19,600. Noted Oct. 22.

EDGESTONE, etc. — **Boston, Mass.** — City, Supply Dpt., P. A. Chapman, supt., to H. E. Fletcher Co., West Chelmsford, furnishing granite edgestones as required straight at $0.87 per lin.ft., circular $1.19, small corners $3.90 each, est. $50,000; to T. H. McVey, 53 Market St., Brighton, straight at $1 per lin.ft., circular $1.40, corners $4.50 each, est. $5,000.

PIPE—**Worthington, Minn.**—City, to Amer. C. I. Pipe Co., 712 Plymouth Bldg., Minneapolis, 1,000 lin.ft. 4 in. pipe at $0.37 per lin.ft., 1,200 ft. 6 in. $0.53, 800 ft. 8 in. $0.74, 600 ft. 10 in. $1, 6,000 ft. 12 in. $1.31.

ASPHALT PLANT—**Sarnia, Ont.**—City Council purchasing asphalt plant for paving purposes, $25,000. W. B. Beatty, City Hall, engr.

EQUIPMENT

PROPOSED WORK

TRUCK—**Berkeley, Calif.**—City purchasing 7,000 lb. capacity garbage truck.

DIESEL ENGINE—**Winterset, Ia.**—City purchasing Diesel engine for municipal light plant, $37,091.

BIDS ASKED

STREET SWEEPER—**Pasadena, Calif.**—Nov. 23, by B. Chamberlain, city clk., motor driven street sweeper.

SEWAGE DIGESTERS—**Indianapolis, Ind.**—Dec. 1, by Sanitary Bd. Commissioners, 32 sewage digesters, $30,000. B. J. T. Jeup, 2415 Talbot Ave., Indianapolis, engrs.

SCREW CUTTING MACHINE, etc.—**Boston, Mass.**—H. M. Lobdell, 130 Broad St., in market screw cutting machine, lathe.

COAL HANDLING EQUIPMENT — **Palmer, Mass.**—Nov. 27, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, coal handling equipment for Monson State Hospital.

PUMPS, etc.—**Quincy, Mass.**—Nov. 25, by District Comm., 20 Somerset St., Boston, furnishing, erecting 2 centrifugal electrically driven vertical type pumps, valves, switchboard piping included, for Commonwealth of Massachusetts, Metropolitan Dist., Boston.

SEWER CLEANING MACHINES — **Long Island City, N. Y.**—Nov. 25, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 2 sewer cleaning machines.

STREET SIGN PLATES—**New York, N. Y.**—Nov. 25, by S. Levy, pres. Manhattan Boro, Municipal Bldg., 3,800 enameled street sign plates.

STEAM BOILERS, etc. — **Columbus, O.** — Nov. 24, by Dpt. Welfare, 9th and Oak Sts., J. McSweeney, dir., two 500 hp. steam boilers for power plant at Ohio Penitentiary, to supply heat and power to new State Office Building, $125,000.

ELECTRIC LIGHT PLANT EQUIPMENT—**Starkville, Miss.**—City 680 hp. addition to electrical light plant, will probably be installed in two 340 hp. units. J. Josey, supt. Water & Light Plant.

CONTRACTS AWARDED

GATE VALVES—**Oakland, Calif.**—East Bay Municipal Utility Dist., furnishing, delivering gate valves, to Rensselaer Valve Co., 55 New Montgomery St., San Francisco, $9,220.

TRANSFORMERS, etc.—**Chatham, N. J.**—Jersey Central Power & Light Co., Chatham, transformers and overhead equipment, to Westinghouse Electric & Mfg. Co., 150 Bway., New York.

CEMENT, etc.—**Brooklyn, N. Y.**—Nov. 25, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, 200,000 gal. asphaltic cement, for sheet asphalt and bituminous concrete mixtures "B" in liquid form.

GRAVEL—**Long Island City, N. Y.**—Nov. 25, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 20,000 cu.yd. cementatious road gravel in scows alongside.

TURBO-GENERATOR UNIT—**Columbus, O.**—J. M. Sweeney, dir. P. Welfare, 9th and Oak Sts., 3,000 kw. turbo-generator unit at Ohio Penitentiary, to General Electric Co., 17 South High St., $67,000. Noted Oct. 1.

COAL HANDLING EQUIPMENT—**Colon, Pa.**—Pittsburgh & Lake Erie R. R. Co., Pittsburgh and Lake Erie Terminal Bldg., Pittsburg, R. P. Forsburg, ch. engr., mechanical coal handling equipment, river rail terminal, to Dra Contg. Co., Neville Island, Pittsburgh.

CONTROL EQUIPMENT—**Phila., Pa.**—Dir. City Transit, C. E. Myers, dir., City Hall Ann Contr. 319, control equipment, incl. fencing, ra ings, gates, grides, hand rails, baggage boar signs, ticket booths, passimeters and turnsti in Market, Vine, Spring, Garden and Fairmou Stations of West Philadelphia Branch of Bro Street Subway in Ridge Ave., to Robbins Cons Co., 1139 North Front St., $55,080. Not Oct. 22.

FOREIGN

New Zealand, Wellington—Dec. 11, by Se retary Thames Valley Electric Power Bd., su ply outdoor type static transformers.

New Zealand, Wellington—Feb. 2, by Secr tary P. Wks., 11,000 volt current limiting r actors and spares and for 11,000 volt switc gear for Lake Coleridge Power Plant.

W. I., Santo Domingo—Committee on C lumbus Memorial, Pan-American Union, Wash D. C., plans by J. L. Gleave, Nottingham, En land, light house memorial, Santo Domin Harbor. $1,500,000.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Mass., Beverly—See "Contracts Awarded."

N. J., Englewood—See "Contracts Awarded."

N. J., Nutley—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Beverly—F. C. Friend Co., 29 Gibson St. Medford, apartment, Gibson St., separate contracts. $400,000. Private plans.

Mass., Cambridge—Jackson Constr. Co., c/o P. J. Brown, archt., 51 Cornhill, Boston, 4 and 10 story, basement, 115 x 150 ft., brick, stone, steel apartment hotel, garage, store, rein.-con. found., Massachusetts Ave. and Garfield St., to G. B. H. Macomber Co., 38 Chauncy St., Boston. Est. $750,000. Noted Oct. 1, under "Contracts Awarded."

Mich., Detroit—R. M. Powell, c/o T. C. Hughes, archt., 204 Wilson Theatre Bldg., 4 story, basement, 42 x 138 ft., brick, rein.-con., steel, stone, plain found., Collingwood Ave., to Leto Building Co., 14250 Kercheval Ave. Est. $150,000.

N. J., Englewood—D. Held, 9 Hill St., Newark, 4 story, basement, brick, steel, Broad St. separate contracts. $150,000. Private plans.

N. J., Morristown — D. Allen, archt., 85 Harrison Ave., West Orange, general contract, rebuilding 3 story, basement, brick, steel hotel to H. Zeliff, 29 Pine St., Morristown, for Newark & Schlosser, Washington Hotel. $150,000. Noted Nov. 12.

N. J., Nutley—B. Lutsky & H. Metnick, 36 Sherman St., Passaic, 4 story, basement, brick steel, Franklin Ave., separate contracts. $150,000. Preiskel & Skvarla, 129 Main Ave., Passaic, archts.

N. Y., Brooklyn—Board Realty Corp., 166 Avenue O, 6 story basement, brick, steel, St. Marks and New York Aves., separate contracts. $160,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—Cameo Constr. Co., H. Baum, pres., 1475 East 46th St., apartment, East 47th St. and Avenue K, separate contracts. $155,000. I. Kallich, 375 Fulton St., archt.

N. Y., Brooklyn—M. Heller & Crawford Corp., 247 West End Ave., apartment, East 58th St. and Tilden Ave., separate contracts. $150,000. Kavy & Kavovitt, 350 Stone Ave., archts.

N. Y., Brooklyn—J. B. and R. Co., N. Jarasham, pres., 26 Court St., apartment, separate contracts. $170,000. J. Kallich, 375 Fulton St., archt.

N. Y., Brooklyn—J. M. Kalt, 26 Court St., apartment, Nostrand Ave. and Avenue N, separate contracts. $165,000. M. Rothstein, 186 Joralemon St., archt.

N. Y., Brooklyn—S. Leider and Siel Building Corp., 905 Lincoln Blvd., 6 story, 100 x 143 ft., Lenox Rd. and 95th St. separate contracts. $230,000. M. Rothstein, 186 Joralemon St., archt.

N. Y., Brooklyn — Osias & Strizver, 186 Joralemon St., 6 story, Bushwick Ave. and Grove St., separate contracts. $150,000. Tabotchnik & Brooks, 32 Court St., archts.

N. Y., Brooklyn—Park Builders, Inc., c/o W. Fine, 1442 55th St., apartment, Bay Ridge and 11th Ave., separate contracts. $150,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—E. N. O. Realty Corp., R. Chodosh, pres., 260 Grafton Ave., apartment, Lenox Rd. and East 57th St., separate contracts. $150,000. J. J. Millman, 67 Court St., archt.

Residential (Continued)

N. Y., Brooklyn — Twin City Development Co., L. Levine, pres., 1334 48th St., 6 story, 83 x 140 ft., 48th St. and 14th Ave., separate contracts. $165,000. S. Gardstein, 44 Court St., archt.

N. Y., Brooklyn—Unity Builders, Inc., D. May, pres., 101 Lawrence St., 6 story, Newkirk and Coney Island Aves., separate contracts, $500,000. Malkind & Weinstein, 93 Court St., archts.

N. Y., New York—Billig Building Corp., 1581 Jerome Ave., 7 story, Pelham Parkway, separate contracts. $600,000. H. I. Feldman, 15 West 44th St., archt.

N. Y., New York—Vinodo Building Corp., 349 East 149th St., 6 story, basement, brick, 60 Cooper St., separate contracts. $275,000. L. Pisciotta, 1912 Arthur Ave., archt.

CLUBS

PROPOSED WORK

Ariz., Tucson—Old Pueblo Club, clubhouse. $200,000.

Ill., Champaign—Y. M. C. A. of University of Illinois, H. Wilson, secy., plans by Childs & Smith, 720 North Michigan Ave., Chicago, 2 story, basement recreational building, on campus. $200,000. J. W. Ogg, Y. M. C. A. Central Bureau, 330 West Adams St., Chicago, assoc. archt.

N. J., Closter—Aldecress County Club, 9 Park Pl., 2 story, basement, brick, steel club house. $150,000. **Maturity probably soon.** Architect not appointed.

N. J., Somerville—B.P.O.E., West End Ave., sketches by Godfrey, Poggi & Bragdon, 275 Morris Ave., Elizabeth, 2 story, basement, brick, steel club house addition. $150,000.

CONTRACTS AWARDED

Neb., Lincoln—Y.W.C.A., C. P. Peterson, pres., general contract 3 story, basement, 100 x 142 ft., concrete, brick, stone, terra cotta, incl. swimming pool, gymnasium, cafeteria, to Olson Constr. Co., 704 Stuart Bldg., $99,800; plumbing and heating, to Hart Plumbing Co., 2726 North 48th St., $17,470. Noted Oct. 21.

HOSPITALS

PROPOSED WORK

Mass., Boston—N. E. Deaconess Hospital, W. S. Cook, supt., sketches by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., hospital unit, Baker Clinic. $150,000 or more.

Mo., St. Louis—Bd. Estimate & Apportionment, City Hall, rejected proposal for $23,750,000 bond election for hospitals, other improvements. Noted Dec. 4.

N. Y., Brooklyn—Brooklyn Nurses' Assn., c/o Bowden & Russell, archts., 19 West 44th St., New York, sketches 87 x 148 ft., nurses home and club, Washington and Green Aves. $600,000.

Pa., Erie—St. Vincents Hospital, 564 West 8th St., O. N. Chafe, pres. Bd. Trustees, sketches 200 room, brick, steel addition, Sassafras St. $600,000. Architect not appointed.

Pa., Norristown—Norristown State Hospital, plans by Ritter & Shea, 1701 Packard Bldg., Phila., hospital. $370,000.

Tex., San Antonio—City and Bexar Co. plans by Phelps & DeWees, 630 Gunter Bldg., and soon takes bids 4 story, basement, 60 x 110 ft., brick, rein.-con. hospital unit to present building, plain found., enlarging heating plant, 515 Morales St. $150,000.

BIDS ASKED

Mass., Waltham—Nov. 27, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 2, 3 and 4 story, basement, irregular sized, brick medical and surgical buildings, plain founds., at Metropolitan State Hospital, $400,000; heating and ventilating to exceed $25,000; electrical work, $25,000 or more; plumbing, $25,000. G. Robb, 87 Beacon St., Boston, archt. A. B. Franklin, Inc., 38 Chauncy St., Boston, engrs. Noted Aug. 6.

N. J., Hackensack—Crow, Lewis & Wick, archts., 200 5th Ave., New York, bids about February, general contract 6 story, brick, steel, hospital addition, 3rd St., for Hackensack Hospital Assn., G. G. Acker, pres., 3rd St. $500,000. Noted July 16.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids about Jan. 1, general contract top addition doctor's residence (dormitory), Clarkson Ave. and Albany St. $210,000. L. P. Ward, 205 East 42nd St., New York, archt. Noted Oct. 29.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids about Jan. 15, general contract top addition to Cumberland Hospital, Cumberland and Myrtle Aves. $300,000. C. B. Meyers, 31 Union Sq., New York, archt. Noted Oct. 29.

N. Y., Brooklyn—Dec. 9, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, patients' building, employee and staff accommodations, garage, power plant equipment and service connections, Brooklyn State Hospital; adv. E. N.-R. Nov. 19. Noted Oct. 29.

N. Y., Central Islip—Dec. 9 (extended date), by Dpt. Mental Hygiene, State Office Bldg., Albany, assembly hall, Central Islip State Hospital; adv. E. N.-R. Nov. 19. Noted Oct. 29.

N. Y., Kings Park—Dec. 2, by Dpt. Mental Hygiene, State Office Bldg., Albany, continued treatment building, employees and staff accommodations, service connections (tunnels), Kings Park State Hospital; adv. E. N.-R. Nov. 19.

N. Y., Poughkeepsie—Dec. 4 (extended date) by Commissioner Mental Hygiene, State Office Bldg., Albany, 7 buildings and service connections at Hudson River State Hospital; adv. E. N.-R. Nov. 19. Noted Oct. 29.

Pa., Pittsburgh—Stone & Webster, engrs., Union Trust Bldg., taking bids subcontracts group hospital buildings for Presbyterian and Eye and Ear Hospital, part of Medical unit of University of Pittsburgh. Total est. $1,500,000. E. P. Mellon & W. L. Smith, Koppers Bldg., Pittsburgh, and 350 Madison Ave., New York, archts. Noted Apr. 2.

Tex., Wichita Falls—Nov. 23, at office State Bd. Control, Austin, hospital, plumbing, heating, electric elevators. R. C. Arnholt, 910 Staley Bldg., Wichita Falls, archt. Noted Aug. 20.

Ont., London—Dec. 1, by Watt & Blackwell, archts., Victor Bldg., additional sanatorium buildings, incl. 3 story, basement, 45 x 290 ft. hospital, 2 story, basement, 45 x 60 ft. nurses home, 1 story, 50 x 60 ft., brick laboratory building, boiler house addition, installing one 150 hp. boiler for central heating plant, for London Health Assn., E. I. Leonard, pres. $300,000.

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., plumbing for Health Center Building, to Anderson & Howe, 45 Belcher St., $59,965; mechanical equipment, to Scott Co., 243 Minna St., $36,938; electrical work, to Alta Electric & Eng. Co., 938 Howard St., $58,349; elevators, to Otis Elevator Co., 1 Beach St., $19,689. Grand total $174,941. Noted Oct. 15.

Mo., Springfield—Burge Hospital, 1323 North Jefferson St., 3 story, basement, 40 x 30 ft., rein.-con. brick hospital additions, to G. F. Hentschel, 1211 South Pickwick St., $84,900. Noted Nov. 5.

T. H., Honolulu—C. W. Dickey, archt., S. M. Damon Bldg., 3 story, rein.-con. nurses' home, to E. E. Black Ltd., Honolulu, for Queens Hospital. $250,000. Noted June 18.

CHURCHES

PROPOSED WORK

Ill., Bloomington—Grace Methodist Church, C. E. Pettit, pastor, plans by Lundeen, Hooten, Roozen & Schaefer, Bloomington, 2 story, brick, stone. Chestnut St. $150,000.

Mass., Salem—St. Mary's Italian Church, P. M. Piermont pastor, Margin St., rebuilding church, recently destroyed by fire. $150,000. Architect not appointed.

Mass., Westwood—St. Margaret Mary's Roman Catholic Church, W. E. Tierney, pastor, 420 High St. Dedham, church. $150,000 or more. Architect not appointed.

N. H., Portsmouth—Immaculate Conception Parish, J. H. Brennan, 98 Summer St., sketches by M. Sullivan, 100 Boylston St., Boston, Mass., church. $150,000 or more.

N. J., Jersey City — Sacred Heart Roman Catholic Church, M. J. Ripple, pastor, Bayview and Jackson Aves., revised sketches 2 story, basement, brick, steel school. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted June 18.

N. J., Morristown—Fanning & Shaw, archts., 40 Ward St., Paterson, soon lets general contract, 2 story, basement, 78 x 135 ft., brick, steel church, school, Columbia St. and Sussex Ave., for St. Margaret's Roman Catholic Church, J. J. Sheerin, 63 Early St. Est. $150,000. Noted Oct. 1.

N. J., Orange—Our Lady of Mount Carmel, Roman Catholic Church, A. Rasi, 103 South Centre St., bids after Dec. 4, general contract 1 story, basement, brick, steel church, $150,000. DePace & Juster, 151 West 46th St., New York, archts. Noted Nov. 5.

BIDS ASKED

Calif., Bakersfield — C. H. Biggar, archt., Bank of Italy Bldg., taking bids 2 story, concrete, Truxton Ave., for First Baptist Church. $150,000.

N. J., Lakehurst—P. P. Cret, archt., 122 South 16th St., Phila., Pa., revising plans and takes bids Jan. 15, general contract 1 story, basement, brick, steel chapel, for American Legion Memorial Chapel Assn., H. Blizzard, pres., Audubon. $150,000. Noted Feb. 5.

R. I., Cranston (mail Providence)—Nov. 23, (extended date), by St. Mathew's Roman Catholic Church, J. Sullivan, pastor, and A. J. Murphy, archt., 25 Fenner St., 1 story, basement, stone, granite church, plain found., Park St. and Elmwood Ave. $150,000 or more; 2 story, basement, brick, stone, school, plain found., Park St., $150,000. Noted Oct. 15, under "Providence."

CONTRACTS AWARDED

Mass., Fall River — St. Patrick's Church, Tuttle St., altering and constructing 3 story, basement, brick, steel convent addition, plain found., Tuttle St., separate contracts. Est. $150,000. Private plans.

Mass., Pittsfield—Sacred Heart Church, 1 story, basement, brick, stone, plain found., to Z. Ducharme, 665 McKenstrie Ave., Aldenville. Est. $150,000. Noted Nov. 12.

Mass., Quincy—Houghs Neck Congregational Church, H. C. Legzat, pastor, 300 Manet Ave., 1 story, basement, concrete, steel, plain found., 310 Manet Ave., to J. B. Battery, 61 Williams St. Est. $150,000.

N. Y., New York—All Souls Unitarian Congregation, 183 East 80th St., general contract church, to Caldwell Wingate Co., 101 Park Ave., New York. Est. $1,250,000. Noted June 4.

SCHOOLS

PROPOSED WORK

Ark., Fayetteville—University of Arkansas c/o Bd. Trustees, soon takes bids 2 and 3 story, basement, concrete, brick, stone library, $400,000. Haralson & Nelson, Merchants Natl. Bank Bldg., Ft. Smith, archt. Jamieson & Spearl, 1116 Arcade Bldg., St. Louis, Mo., consult. archts. Noted June 27.

Ark., Fayetteville—University of Arkansas c/o Bd. Trustees, soon takes bids 2 and 3 story, basement, concrete, brick, stone science building, $300,000. Wittenberg & Delony, Southern Bldg., Little Rock, archts. Jamieson & Spearl, 1116 Arcade Bldg., St. Louis, Mo., consult. archts.

Calif., Oakland—Dominican Fathers, Steiner and Bush Sts., San Francisco, plans by A. Constable, 580 Market St., San Francisco, fireproof house of studies building, College Ave. and Chabot Rd. $500,000.

Calif., San Francisco—City and San Francisco Co. defeated $3,500,000 new schools and additions. Bond issue may be again submitted in May. Noted Sept. 10.

Colo., Colorado Springs—Trustees Colorado College, c/o C. C. Mierow, pres., plans by J. G. Meem, Santa Fe., N. M., library.

Conn., Greenwich—Town, Superintendent Schools, plans by Coffin & Coffin, 522 5th Ave., New York, Bryan High School addition. $325,000.

Ga., Atlanta—Atlanta University, plans by James Gamble Rogers, 154 East 46th St., New York, and takes bids in January, general contract 5 college buildings, $625,000.

Ill., Champaign—University of Illinois cancelled bids to have been opened Nov. 20, 4 story dormitory on campus. J. White, Administration Bldg., University of Illinois, Urbana, archt. Noted Nov. 5.

Mass., Burlington—Town, Building Comm., J. A. Bustead, Junior and Senior High School, 2 story, basement, brick, stone, incl. gymnasium, auditorium, $150,000-$160,000. Architect not appointed. Noted May 28.

Mass., Framingham—Commonwealth of Massachusetts, Dpt. Educ., State House, Boston, hall, gymnasium, auditorium, State St. $150,000 or more. Architect not appointed.

Mass., Norton — Wheaton College, J. E. Park, pres., sketches by cram & Ferguson, 248 Boylston St., Boston, 3 story, basement, 12 regular sized, brick dormitory. $150,000 or more.

Neb., Lincoln—University of Nebraska, c/o L. F. Seaton, operating supt. soon takes bids revised plans 3 story, basement, girls dormitory, rein.-con., brick, incl. parlors, dining room, kitchen, 16th St., between S and U Sts., $269,000. Davis & Wilson, 525 South 13th St., archts. Noted Aug. 6.

N. H., Plymouth—Holderness, Schools for Boys, E. Weld, sketches by J. F. Larson, 27 East Wheeler's Ave., brick, steel school. $150,000.

N. J., Finderne—Bd. Educ. Bridgewater Twp., 2 story, basement, brick, steel addition, Finderne Ave. $150,000. Architect not appointed.

N. J., Hackensack—Bd. Educ., 355 State St., revised sketches by A. Dore, 15 Main St., and takes bids about January 2 story, basement, brick, steel, rein.-con., Hobart St. $180,000.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., sketches by F. Lansing, 59 Washington Pl., 2 story, basement, brick, steel addition to Lincoln Grade School, Ottawa Ave. $150,000. Noted Nov. 5.

N. J., Madison—Bd. Educ., G. F. Sutherland, pres., High School, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel, Kings Rd. $250,000.

N. J., Madison—Bd. Educ., G. F. Sutherland, pres., High School, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, general contract 2 story, basement, brick, steel high school addition, Main St. $150,000. Guilbert & Betelle, 60 Branford Pl., Newark, archts. Noted Oct. 15.

N. J., Union—Bd. Educ., High School, new sketches by F. A. Elsasser, 1000 Stuyvesant Ave., and takes bids about Jan. 15, 2 story, basement, brick, steel addition to Connecticut Farms School, Stuyvesant and Morris Aves. $150,000. Noted July 16.

N. Y., Alfred—Alfred University college group, incl. liberal arts hall $250,000, women's dormitory $150,000, executive offices $75,000, gymnasium $100,000. Plans campaign for funds.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, soon takes bids P. S. 240, Avenue I and East 31st St. $700,000. Noted Apr. 16.

N. Y., Corona—Bd. Educ., 500 Park Ave., New York, soon takes bids addition P.S. 16, 104th St. from 41st to 42nd Aves. $225,000.

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Schools (Continued)

W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt. Noted Oct. 16.

N. Y., Grymes Hill (mail Staten Island)—Academy of Our Lady of Blessed Sacrament, Howard Ave., bids early in spring, general contract 2 story, basement, brick, steel high school, Howard Ave. $150,000. Sibley & Fetherston, 205 East 42nd St., New York, archts. Noted Mar. 19.

N. Y., Jackson Heights—Bd. Educ., 500 Park Ave., New York, soon takes bids P.S. 2, 21st Ave., 75th and 76th Sts. $195,000. C. W. Martin, Flatbush Ave. extension and Concord St., Brookiyn, archts.

N. Y., Middleburg—Bd. Educ. plans by A. E. Gilbert, 358 5th Ave., New York, school. $350,000.

O., Wickliffe—Bd. Educ. plans by Fulton & Taylor, 8120 Euclid Ave., Cleveland, 2 story, brick, steel, concrete. $150,000 voted for same. Noted Sept. 10.

Pa., Rochester — Bd. Educ., A. T. Shaker, secy., sketches Grade and Junior High School, brick, steel, Community Springs. $150,000. Architect not appointed.

Ont., Sudbury—Bd. Educ., J. E. Lowe, secy., 18 Elm St., plans by P. J. O'Gorman, Mackey Bldg., high school addition. Baker and McKenzie Sts. $170,000.

BIDS ASKED

Md., Annapolis—Nov. 24, by Buckler & Fenhagen, archts., 325 North Charles St., high school, 3 story, basement, brick, steel, concrete, for Anne Arundel Co. School Comrs., Annapolis, $175,000. H. F. Doeleman, Baltimore Trust Bldg., engr. Noted Oct. 29.

Mass., Fall River—See "Contracts Awarded."

Mass., New Bedford—Mt. Carmel Roman Catholic Church, A. P. Viorira, pastor, 230 Bonney St., bids about Nov. 18, 2 story, basement, brick school, plain found., Rivet and Bonney Sts. $150,000. H. Fallows, 131 Stewart St., Fall River, archt. Noted Oct. 15.

Mass., Roslindale (sta. Boston)—Nov. 25, by City of Boston, Dept. School Buildings, 2 story, basement, brick, stone school, plain found., Beech St. $150,000. H. R. Duffie, 364 Belgrade Ave., archt. Noted Oct. 15.

N. J., Darien—Bd. Educ., E. B. Fuller, supt., Renshaw Rd., bids about Dec. 15, general contract 2 story, basement, brick, steel, plain found., Hoyt St. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archts.

N. J., Piscataway town — Bd. Educ, Raritan Twp., bids about Dec. 15, 2 story, basement brick, steel, rein.-con., addition to Oak Tree School. $150,000. Jensen & Rasmussen, 218 Smith St., Perth Amboy, archts. Noted Oct. 22.

N. J., West Fort Lee—Bd. Educ., J. C. Abbott, secy., High School, bids about Jan. 15, general contract 2 story, basement, brick, steel, Main and Linwood Aves. $150,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Oct. 1.

N. Y., Floral Park—Nov. 30, by Rasmussen & Wayland, archts., 36 West 47th St., New York, general contract school, for Florham School, c/o architect. To exceed $150,000.

N. Y., Mount Vernon—Bd. Educ., 60 South 3rd Ave., bids about Dec. 14, George Washington School. $500,000.

O., Tiffin—City Bd. Educ., bids about Feb. 1, 2 story, basement high school addition. $155,000. T. D. McLaughlin & Associates, Lima, archt. Noted Apr. 30.

Pa., Glenshaw—Nov. 27, by Bd. Educ. Shaler Twp., F. C. Koussman, pres., 3 story, basement, brick, hollow tile elementary and high school, incl. gymnasium, auditorium, manual training rooms, Mt. Royal Blvd. $220,000. Ingham & Boyd, Empire Bldg., Pittsburgh, archts. Noted Oct. 22.

CONTRACTS AWARDED

Calif., Berkeley — University of California, general contract men's gymnasium building, to Dinwiddie Constr. Co., Crocker Bldg., San Francisco, $418,000; electrical work, to Turner Co., 329 Tehama St., San Francesco, $30,474; heating, to Alta Electric & Mfg. Co., 938 Howard St., San Francisco, $109,697; plumbing, to F. W. Snook, 596 Clay St., San Francisco, $75,625. Grand total $633,796. Noted Apr. 2.

Colo., Denver—Bd. Educ., general contract Greenlee School, 2 story, 60 x 300 ft., rein.-con., brick, terra cotta, to F. B. Anderson, 2963 Walnut St.; heating and ventilating, to McCarty-Johnson Heating & Ventilating Co., 1440 Curtis St., $33,988; plumbing, to Denver Plumbing & Heating Co., Denver, $8,600. Grand total $227,567. Noted July 9.

Conn., New Haven—Yale University, T. W. Farnham, new Berkley Dormitory, to Marc Eidlitz & Sons, 100 East 42nd St., New York. Est. $150,000.

Ill., Evanston — Northwestern University, Thorne Auditorium, to R. C. Wieboldt Co., 1412 West Washington Blvd., Chicago. Est. $300,000.

N. J., Bordentown — Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 1 story, basement, girls' dormitory, brick, steel, to H. B. Miller, Edgewater Park; plumbing, to P. S. Slack, 211 Perry St., Trenton; heating, to Burns, Lane & Richardson Co., 41 Adams St., Trenton; electrical work, to Mercer Electric Co., 338 South Broad St., Trenton. Est. $150,000. Noted Sept. 3.

N. J., Hackensack—Bd. Educ., 355 State St., general contract altering and constructing 2 story, basement, brick, steel addition to School 1, to S. Pluchino, 320 8th St., West New York; plumbing and heating, to D. McGrath Co., 185 Moore St., Hackensack; electrical work, to Walter Kingsley Co., 21 Mercer St.; steel and iron, to Hudson Structural Iron Wks., Inc., foot Henderson St., Jersey City. Est. $150,000.

N. J., Sussex—Bd. Educ., 2 story, basement, brick, steel high school, to Stoneback & Nase, 348 Franklin St., Quakertown, Pa.; heating, to Larence Hardware Co., Sussex; steel and iron, to Bethlehem Fabricators, Inc., West Lehigh Ave., Bethlehem, Pa. Est. $150,000. Noted Oct. 22.

N. J., West Orange—Bd. Educ., High School, general contract Junior High School, 3 story, basement, 100 x 275 ft., brick, steel, to C. J. Smith Constr. Co., 202 Academy St., Trenton, $304,500; plumbing, to Ruehl & Hatford, Inc., 384 South 10th St., Newark, $31,628; heating, to D. McGrath Co., 185 Moore St., Hackensack, $47,758; electrical work, to Beaver Eng. Co., 59 Mechanic St., Newark, $26,968; steel and iron, to Passaic Steel & Iron Wks., 782 Paterson Ave., East Rutherford, $24,750. Grand total $435,604. Noted Oct. 29.

N. Y., Whitestone—Bd. Educ., 500 Park Ave., New York, general contract addition to P.S. 79, to Jonwal Constr. Co., 2 Beekman Pl., New York, $309,300. Noted Oct. 22.

R. I., Providence—City, P. Building Dpt., City Hall, 2 story, basement, brick, stone, steel school, plain found., to Tucker Constr. Co., New Industrial Trust Bldg., $451,300; heating, to Grinnell Co., Inc., 260 West Exchange St., $55,339; plumbing, to J. P. Cuddigan, 938 Broadway, East Providence, $30,970. Grand total $537,609. Noted Oct. 15.

BANKS

PROPOSED WORK

N. Y., Albany—Albany County Savings Bank, 88 State St., will not build bank and office, State and Pearl Sts. This corrects report in Oct. 8 issue.

CONTRACTS AWARDED

N. Y., New York—First National Bank of New York, 2 Wall St., 20 story bank, office, to Marc Eidlitz & Son, 100 East 42nd St. Est. exceeds $1,000,000. Noted Oct. 29.

OFFICES

PROPOSED WORK

N. J., Long Branch—Jones and Van Hise & Lesiwitz, 176 Bway., soon takes bids general contract 2 story, basement brick, steel office, 225 Bway. $150,000. L. Cubberly, 210 Bway., archt.

N. J., Union—Aryan Holding Co., 998 Stuyvesant Ave., sketches 2 story, basement, brick, steel, rein.-con. office, store, post office. $150,000. Treas. Dpt., Wash., D. C., lessee.

Wis., Sheboygan—Owner, c/o E. A. Juul, archt., Security Bank Bldg., 1 story, basement, 25 x 80 ft., rein.-con., brick commercial building. $150,000.

BIDS ASKED

N. J., Morristown—W. E. Lehman, archt., 972 Broad St., Newark, bids about Jan. 15, general contract 2 story, basement, brick, steel professional building, store, South Pine St. for Stamelman Realty Co., c/o architect. $150,000. Noted Sept. 10.

STORES

PROPOSED WORK

N. J., Jersey City — W. T. Grant Co., 1441 Bway., New York, bids about April, general contract 2 story, basement, brick, steel, store, Newark Ave. and Barrow St. $250,000. Private plans. Noted Oct. 22.

BIDS ASKED

N. J., Montclair — Martin Realty Co., 39 Broad St., Bloomfield, bids about Dec. 1, general contract 2 story, basement, brick, steel store, office, 607-11 Valley Rd. $150,000. Private plans. Noted Oct. 1.

CONTRACTS AWARDED

N. Y., Forest Hills—Corporation, c/o W. O'Melia, 3759 82nd St., Jackson Heights, 80 x 100 ft. store, apartment, Pilgrim St. near Queens Blvd., separate contracts. To exceed $150,000.

LOFTS

PROPOSED WORK

B. C., Vancouver—Mart Holdings, Ltd., J. F. Erskine, mgr., 825 Granville St., sketches by Bowman & Cullerne, 815-16 Yorkshire Bldg., 10 story, 125 x 300 ft., rein.-con. loft building to be used as a merchandise market, Pender St. W. $750,000

PUBLIC

PROPOSED WORK

Mass., Nantucket—OFFICE—Town and Nantucket Co., sketches by F. O. Ackermen, Hill, 3 story, basement, brick town and co office building, Federal St. $200,000.

Mich., Kalamazoo — COURT HOUSE JAIL — Kalamazoo Co., plans by LeRoy Newlander, Kalamazoo, 6 story, basement x 158 ft., brick, rein.-con., steel, plain fo $600,000.

N. Y., Jamaica—COURT HOUSE—G Harvey, pres. Queens Boro, Queens Sub Bldg., Long Island City, selected site for house, Sutphin Blvd. and 88th Ave. $2,000 Noted Aug. 20.

R. I., Pawtucket—HOME—City, P. Wel Dpt., C. W. Green, sketches by Monahan Meikle, 225 Main St., city home. $150,000 more. Noted Nov. 12.

Tex., Longview—COURT HOUSE and JAIL Gregg Co. bids in December, 5 story, basem 93 x 110 ft., brick, rein.-con., steel, found. $150,000. Voelcker & Dixon, Perk Snider Bldg., Wichita Falls, archts. No Oct. 1.

Tex., San Antonio—POLICE and FIRE—C c/o C. M. Chambers, mayor, improvements police and fire departments, incl. 1 large building, and some smaller improvements, eq ment for fire department. $300,000. I. E city engr.

BIDS ASKED

N. J., Caldwell — BORO HALL — Bd. Council, Boro Hall, bids about Dec. 15, 2 st basement, brick, steel. $150,000. Guilbert Betelle, 20 Branford Pl., Newark, archts. No Oct. 1.

N. J., New Brunswick—COURT HOUSE—F Freeholders Middlesex Co., County Record Bld bids about Dec. 1, general contract rebuildi 4 story, basement, brick, steel. $150,000. B lan & Levine, 143 Albany St., archts. No Sept. 24.

N. J., Trenton—ARMORY—Nov. 24, by Dp Institutions & Agencies, State Office Bldg., se eral contract 2 story, basement, brick, infantry armory addition. $150,000. In Archt. & Constr. Co., State Office Bldg., archt

N. Y., Attica—CELL HOUSING, etc.—Dec. (extended date), by Dpt. Correction, State Offic Bldg., Albany, North Cell Housing, Reception and Disciplinary Building, Auditorium and Chapels, School, Covered Ways and Arcade Service Connection, Attica State Prison. Noted Oct. 29.

CONTRACTS AWARDED

Ind., Evansville—COLISEUM—E. Koenemann and Vanderburgh Co., general contract 2 story basement brick, steel, to Long & Smith, 30 Lincoln Ave. Est. $150,000. Noted Oct. 1.

UNCLASSIFIED

PROPOSED WORK

Calif., Pasadena—MUSEUM—Pasadena A Institute soon lets general contract 1 story 108 x 136 ft. museum, probably concrete Carmelita Park. Noted Oct. 22.

N. J., Asbury Park—DANCE HALL, etc. R. DuPreer, 1920 Corlies Ave., Neptune City sketches 2 story, basement, brick, steel, dance hall and pool parlor, Spring St. $150,000.

Pa., Phila. — TEMPLE of MUSIC and DRAMA—Philadelphia Arts Assn., c/o Curtis Institute, 1726 Locust St., bids late in January general contract, 1 story, basement, 3 auditoriums, 19th and Race Sts. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts Noted July 30.

BIDS ASKED

Calif., San Francisco—EXCHANGE—Engineering Dpt. Pacific Telephone & Telegraph Co. 140 Montgomery St., taking bids 2 story, reinf. con. brick, Pine and Steiner Sts. To exceed $150,000.

Md., Elkton—PASSENGER STATION—See "Railways."

Mass., Quincy—PASSENGER STATION—Nov. 25, by New York, New Haven & Hartford R.R. Co., A. P. Russell, vice-pres., E. E. Oviatt, ch. engr., New Haven, Conn., on Quincy Adams Station, brick, stone. To exceed $150,000

CONTRACTS AWARDED

Mass., Boston—RAILROAD STATION—New York, New Haven & Hartford R.R., South Station, altering, 1 story, brick, steel, to Treden nick-Billings Co., 10 High St.

N. J., Princeton — LABORATORY — Rockefeller Institute, York Ave. and 66th St., general contract laboratory of animal and plant pathology, to Matthews Constr. Co., Princeton To exceed $150,000. Noted Oct. 8.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Hanford—DRY ICE PLANT—Owner, c/o group New York City capitalists plans by W. C. Kirkpatrick, 124 West 4th St., Los Angeles, dry ice plant.

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Factories and Mills (Continued)

Calif., Los Angeles—FACTORY—Loose-Wiles Biscuit Co., 811 Commerce Bldg., Kansas City, Mo., A. E. Lemke, in charge (1st unit), 1 story 80 x 250 ft. distribution building, Gage Ave. and Avalon Blvd.; also preparing plans 6 story, 150 x 250 ft. main building, incl. baking, packing, shipping departments. Total est. $1,500,000. Private plans.

Calif., Los Angeles — CREAMERY — Western Holstein Farms, Inc., 3402 Avalon Blvd., sketches 2 story, 150 x 150 ft., concrete, 31st St. and Grand Ave. $100,000.

Calif., Riverside—PACKING HOUSE—Union Pacific System, Pacific Electric Bldg., Los Angeles, plans by Architectural Dpt. of Owners, Pacific Electric Bldg., Los Angeles, 1 story, basement, 80 x 150 ft., masonry, 4th and Vine Sts. $50,000. Riverside Fruit Co., lessee.

Calif., Upland—PRE-COOLING PLANT—Upland Citrus Assn. plans by W. W. Ache, 1616 4th St., Los Angeles, rein.-con., brick. $65,000.

Miss., Biloxi—ICE CREAM PLANT—Ness Creameries, C. Cox, mgr., soon takes bids 1 and 2 story, 50 x 100 ft., rein.-con., brick; steel sash, sheet metal, West Howard and Callavet Sts. $50,000. Helfensteller & Hirsch & Watson, 1501 Chemical Bldg., St. Louis, Mo., archts.

N. J., Fairlawn — INDUSTRIAL PLANT — Owner, c/o J. C. Van Vlandren, archts., 140 Market St., Paterson, sketches 1 story, basement, brick, steel, Sherman Ave. $40,000.

N. J., Little Falls—LAUNDRY, etc.—Little Falls Laundry Co., Main St., bids in December, general contract 1 story, basement, 65 x 85 ft., brick, steel, rein.-con. laundry, and 2 story, basement, 140 x 280 ft. garage, Main St. $150,000. F. W. Wentworth, 140 Market St., Paterson, archt., O. E. Goldschmidt, 110 West 40th St., engr. Noted Nov. 5.

N. Y., Brooklyn — GAS PLANT — Kings County Lighting Co., 6740 4th Ave., gas plant extensions, additions, New Utrecht Ave. and 62nd St. To exceed $40,000.

N. Y., Brooklyn—FACTORY—C. Pfizer & Co., 81 Maiden Lane, New York, plans by Wallace Drummond Brewer Eng. Co., 468 4th Ave., New York, fuel equipment, boiler tank pits and altering plant, Gary St. and Marcy Ave. $40,000.

N. Y., New York—LAUNDRY, etc.—Benenson Realty Co., 424 Madison Ave., plans by C. Shaefer, Jr., 332 East 149th St., laundry, office, 204 East 97th St. $110,000.

N. Y., New York—LAUNDRY—Presbyterian Hospital, 620 West 168th St., plans by James Gamble Rogers, 156 East 46th St., 2 story, vicinity 165th St. and Bway. $175,000.

O., Toledo—REFINERY—Standard Oil Co. of Ohio, 526 High St., acquired plant from Solar Refining Co., and plans reconstructing and constructing additions to same. Work will probably be done by separate contracts and day labor.

O., West Lafayette — FACTORY — Moore Enameling Mfg. Co., West Lafayette, soon takes bids new enameling plant, adjacent to present factory. $50,000. Private plans.

Tex., Harlingen—PACKING PLANT, etc.—Atlantic Comn. Co., c/o L. C. Baum, div. mgr., Harlingen, soon lets contract 2 story, brick, rein.-con., face and common brick packing plant, office, plain found. Private plans.

Tex., Raymondville—CREAMERY PLANT—W. J. McKnight, 1 story, rein.-con., hollow tile, stucco, cast stone creamery plant. Architect not appointed.

Tex., Violet—COTTON GIN—Serv-U-Gin Co., c/o J. W. Jalufka, Violet, 28 x 100 ft., brick, rein.-con., tile or all steel, plain found., $40,000. Private plans. Owner will probably build, purchase machinery, etc., in February.

Va., Danville — OIL STORAGE PLANT — Standard Oil Co. of New Jersey, F. C. Bigley, in charge, Standard Oil Bldg., Baltimore, Md., 1 and 2 story, brick, steel plant. $50,000. Private plans.

Va., Staunton — OIL STORAGE PLANT — Standard Oil Co. of New Jersey, F. C. Bigley, in charge, Standard Oil Bldg., Baltimore, Md., 1 and 2 story office, warehouse, garage, oil storage building. $50,000. Private plans.

Wis., Appleton—ICE PLANT—Lutz Ice Co., O. Lutz, pres., 109 North Morrison St., 2 story, 85 x 150 ft., rein.-con., brick. $40,000 incl. machinery. Architect not appointed.

Ont., Windsor—FACTORY—A. S. Boyle Co., W. Whiteside, Bank of Commerce Bldg., in charge, factory to manufacture pharmaceutical supplies, cosmetics, College and Campbell Sts. $50,000.

Que., Ste. Therese—FACTORY—Zonite Products Ltd., 405 Lexington Ave., New York, soon lets contract anti-septic manufacturing plant. To exceed $40,000.

BIDS ASKED

Calif., Hayward—PACKING PLANT—J. M. Smith, engr., 251 Kearny St., taking bids 1 story, 50 x 110 ft., concrete, for N. J. Batteate, Hayward.

Ind., Elkhart—FACTORY—Illinois Carton & Label Co, bids about Dec. 1, 1 story, 130 x 200 ft., brick, steel, Clark and Elkhart Sts. $40,000. Private plans. Noted Nov. 12.

Ind., Howell—OIL REFINERY—See "Contracts Awarded."

Ind., Whiting — PLANTS — See "Contracts Awarded."

Mass., Reading — FACTORY — Nov. 27, by Ace Art Co., L. Riley, mgr., 12 Gould St., altering and constructing 1 and 2 story, brick, steel, addition, plain found. $40,000. D. J. Abrahams, 260 Tremont St., Boston, archt.

Mo., St. Louis—BAKERY—Kroger Grocery & Baking Co., A. S. Grogg, genl. mgr., 3816 Shaw Ave., bids about Dec. 10, 4 story, basement, 85 x 130 ft., rein.-con., brick bakery and garage, incl. boiler room, 1311 South 39th St. $750,000. E. H. Niemann, 3816 Shaw Ave., archt. Noted Oct. 22.

N. J., Bloomfield—FACTORY—General Electric Co., Lawrence St., new bids about Dec. 15, general contract 1 story, basement, brick, steel addition, Lawrence St. $40,000. Former bids rejected. Private plans. Noted Sept. 3.

N. J., Elizabeth—FACTORY—Elizabeth Lumber Co., M. Goldberg, in charge, 1057 Grand St., taking bids general contract 2 story, basement, brick, steel, Grand St. $40,000. J. Anderson, 251 North Broad St., archt.

N. J., Woodbridge—FACTORY—B. Farer, 59 Avenal St., bids about Dec. 1, general contract altering and constructing 2 story, basement, brick, steel addition, Wolf Pl. and Avenal St. $40,000. E. C. Wierzbicki, 175 Smith St., Perth Amboy, archt. Noted Oct. 22.

N. Y., Beacon—LAUNDRY, etc.—Dec. 3, by Commissioner Correction, State Office Bldg., Albany, laundry and tailor shop building, staff house, Matteawan State Hospital, adv. E.N.-R. Nov. 19.

CONTRACTS AWARDED

Calif., Claremont—PRE-COOLING PLANT—Union Ice Co., 8 car daily capacity, rein.-con., to Gay Eng. Corp., 8650 Santa Fe Ave., Los Angeles.

Calif., Oakland—FACTORY—Edy Candy Co., 3315 Grand Ave., 2 story, brick, Lakeshore Ave., to Lindgren-Swinerton, Inc., 225 Bush St., San Francisco. $40,000.

Calif., Sacramento—PRINTING PLANT—State Dpt. P. Wks., Div., Architecture, Sacramento, general contract 2 story, basement, rein.-con. annex, to W. C. Keating, Forum Bldg., $63,330; plumbing, ventilating and heating, to Carpenter & Mendenhall, 907 Front St., $11,900. Noted Oct. 22.

Ill., Kankakee — FACTORY — Bear Brand Hosiery Co., 337 Madison St., Chicago, 3 story, basement, 60 x 123 ft., brick, steel, plain found., Washington St., to Immel Constr. Co., 19 West Division St., Fond-du-Lac, Wis. Est. $40,000.

Ind., Howell—OIL REFINERY—Security Oil & Refining Co., new plant, own forces. $60,000.

Ind., Marion—FACTORY—Osborne Paper Co., general contract 2 story, basement, brick, steel, to C. W. Barley, Marion. Est. $40,000.

Ind., Whiting—PLANTS—Standard Oil Co. of Indiana, rehabilitation of buildings, additions to production facilities, replacing old equipment, day labor. $1,000,000.

Ia., Waterloo — PACKING PLANT — Rath Packing Co., J. M. Rath, pres., 4 story, basement, 60 x 132 ft., rein.-con., brick, Elm and Sycamore Sts., to H. A. Maine Constr. Co., 305 Marsh-Place Bldg. Est. $100,000.

Md., Cumberland—PLANT—Celanese Corp. of America, 1 story, 66 x 170 ft. addition, to Wright Richardson & Co., Cumberland. Est. $80,000.

Mass., Cambridge—FACTORY—J. L. Hammett Co., Kendall Sq., altering and constructing 2 story, brick, concrete addition, to J. M. and C. J. Buckley Co., 183 Essex St., Boston. Est. $40,000.

Mass., Cambridge — MANUFACTURING — Simplex Wire & Cable Co., 66 Sidney St., altering and constructing 3 story, concrete addition, 79 Sidney St., to Chase & Gilbert, Park Sq. Bldg., Boston. Est. $40,000 or more.

Mass., Chelsea — FACTORY — Crescent Shoe Mfg. Co., 112 Crescent Ave., altering and constructing 1 story, brick, timber, concrete addition, to B. Steinberg Constr. Co., 587 Putnam Ave., Cambridge. Est. $40,000.

Mass., Everett—PLANT—Merrimac Chemical Co., J. B. Ruffer, Chemical Lane, 1 story, 70 x 130 ft., brick, H-acid plant, to Tredennick-Billings Co., 10 High St., Boston. Est. $40,000. Noted Nov. 5.

Mass., Lawrence—SULPHUR PLANT—Beach Soap Co., 125 Lawrence St., 3 story, basement, steel, concrete sulphur building, plant unit, Lawrence St., to E. A. Peabody & Son, Bay State Bldg. Est. $40,000.

N. J., Bayonne—LABORATORY—Babcock & Wilcox Co., East 3rd St., general contract 4 story, basement, brick, steel, rein.-con., to F. H. McGraw & Co., 51 East 42nd St., New York. Est. $50,000. Noted Oct. 22.

N. Y., Brooklyn—BULK STATION—Texas Corp., 135 East 42nd St., New York, bulk station, Clinton St. at waterfront, to P. M. Sterling, 230 Park Ave., New York. Est. $40,000.

N. Y., Brooklyn—DAIRY PLANT—Jersey Maid Ice Cream Co., 32 Little Nassau St., ice cream plant, to P. M. Sterling Co., 230 Park Ave., New York. Est. $150,000. Noted June 4.

R. I., East Greenwich — TEXTILE MILL — Greenwich Mills, 3 story, 75 x 94 ft., brick addition, to O. D. Purington & Co., 49 Westminster St., Providence. Est. $50,000. Noted Nov. 5.

Wis., Appleton—PLANT—Badger Paint Store, Inc., L. Olsen, mgr., 1 story, 40 x 80 ft., rein.-con., brick, College St., to F. Piette, 1414 North Richwood St. Est. $40,000.

GARAGES

PROPOSED WORK

N. J., Jersey City—B-R Service Station, Inc., lessee, c/o J. I. Kislack, Inc., 29 Journal Sq., service repair garage. Tonnele Circle. To exceed $40,000.

N. Y., Maspeth—Maspeth Realty Associates, 162 Remsen St., Brooklyn, 1 story, 100 x 1[illegible] ft., service garage, vicinity Maspeth and 58rd Aves. $50,000.

N. Y., New York—Domenico Sabbatino, 1839 Sedgewick Ave., sketches by DeRose & Cavalieri, 370 East 149th St., 2 story, brick, garage and gas station, Sedgewick Ave. and 169th St. $40,000.

N. Y., New York—A. Schraders Sons, Inc., 400 Vanderbilt Ave., Brooklyn, plans by W. Shary, 22 East 17th St., 2 story, 75 x 108 ft. garage, 28 Rose St. $100,000.

CONTRACTS AWARDED

Conn., Bridgeport—White Line Bus Corp., W. Sperry, pres., 4490 Main St., 1 story, 80 x 120 ft., brick, steel, concrete bus terminal extension, Main St., to Sperry & Treat Co., 294 Kimberly Ave., New Haven. Est. $40,000. Noted Oct. 15.

Ga., Atlanta — Asa G. Candler, Inc., Candler Bldg., 1 story, 66 x 103 ft., rein.-con., structural steel, brick garage, Ellis St. and Carnegie Way N. E., to Carr Constr. Co., Candler Bldg.

Ia., Des Moines—Interstate Transit Lines, 422 Grand Ave., general contract altering, remodeling bus depot, 5th and Grand Ave., to A. H. Neumann & Co., 519 Hubbell Bldg., $19,891; heating and plumbing, to W. L. Dwyer & Co., 543 6th Ave., $1,323; electric wiring, to Furlong Electric Co., 308 9th St., $339. Grand total $21,553.

Mass., Brockton—Packard Car Agency, Warren Ave., 1 story, 100 x 200 ft., brick, steel garage, concrete found., to Long Constr. Co., 185 Devonshire St., Boston. Est. $50,000 or more. Noted Oct. 29.

Mass., Watertown—H. P. Hood & Sons, Inc., A. Morse, 500 Rutherford Ave., Charlestown, 1 story, basement, brick, steel service station, plain found., Pleasant St., to Wm. Bailey Co., 88 Broad St., Boston. Est. $40,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

Mass., Norfolk — SHOP — Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, sketches by McLaughlin & Burr, 88 Tremont St., Boston, 1 story, brick, sheet metal shop (Factory 11), at State Prison Colony. $60,000.

POWER PLANTS

PROPOSED WORK

Calif., Bakersfield—See "Waterworks."

Que., Westmount—City improving, modernizing electric light department. $55,000.

BIDS ASKED

Ia., Remsen—Nov. 23, by City, light and power plant. $75,000. J. F. Gamerdinger, mayor. Noted Oct. 29.

Mass., Palmer—Nov. 27, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 1 story, brick, steel boiler house, plain found., at Monson State Hospital, incl. electrical work and equipment, piping and equipment, boiler settings, chimney. E. C. Brown Co., 77 Summer St., Boston, engrs. Noted Aug. 13.

CONTRACTS AWARDED

Ind., Ft. Wayne—Bd. P. Wks., City Hall, power plant, Div. 3, installing 2 ash hoppers, to Allen-Sherman-Hoff Co., Lewis Bldg., Phila., Pa., $6,890; Divs. 4 and 5, furnishing, installing force drafts fans, cinder collectors, steel stacks, other items, to Western Gas Constr. Co., 2001 East Pontiac St., $32,362; Divs. 6 and 7, 2 electric driven and 1 steam driven boiler feed pumps, 6 other centrifugal pumps with motors, to Ingersoll-Rand Co., 11 Bway., New York, $14,532; Divs. 8 and 9, furnishing 6 feed water heaters, one boiler water reconditioning system, to Cochrane Corp., 17 bl. Allegheny Ave., Phila., Pa., $8,943; Div. 10, 1 exciter an dmotor control, to General Electric Co., 1655 Bway., $7,396. Grand total $70,023. Noted Aug. 20.

Ind., Newcastle — Epileptics Village, general contract rein.-con., brick, steel, stone, heating plant, to Stein Kamp Constr. Co., Batesville, boiler setting, to A. R. Hunnicut, New Castle, pipe fittings, to Freyn Bros., 1028 North Illinois St., Indianapolis. Est. $50,000. Noted Oct. 22.

N. D., Grafton—State Bd. Administration, E. G. Wenner, secy., general contract 2 story, basement, brick, steel power and heating plant for State Institute of Feeble Minded, to J. H. Mackley, Minot, $24,600. Noted Oct. 15.

WAREHOUSES

PROPOSED WORK

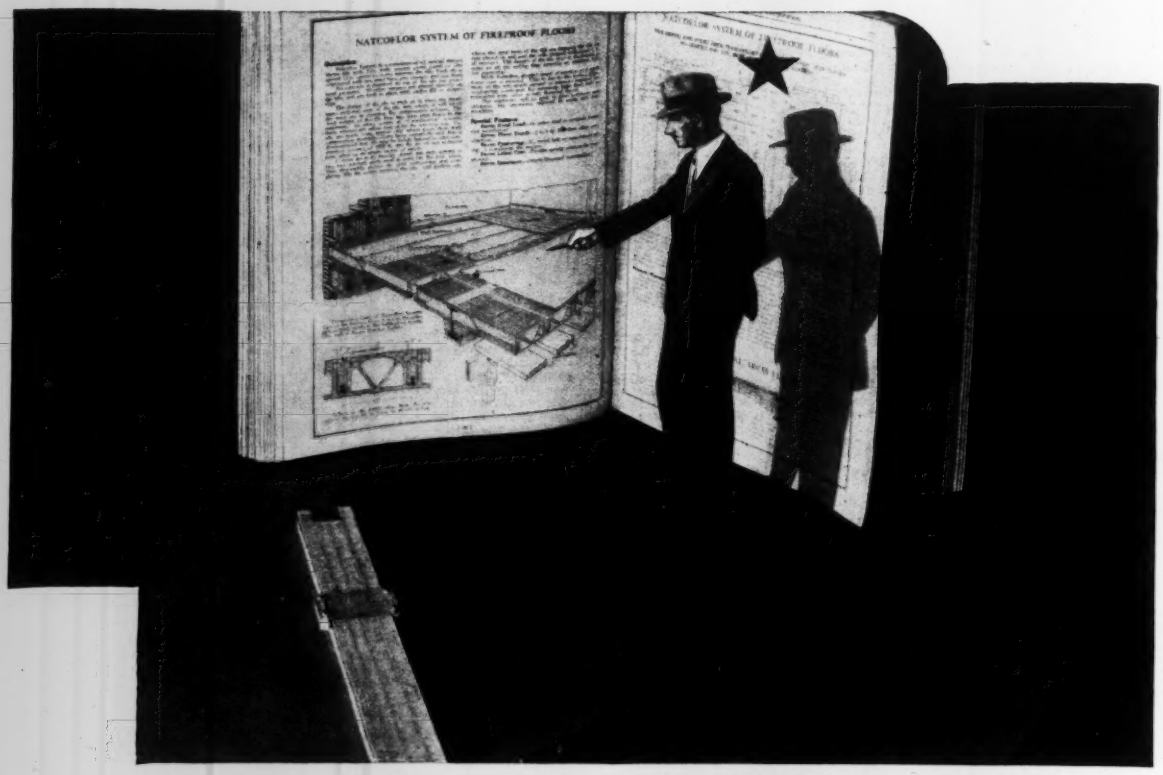
Mass., Saugus—Pines River Terminal Co., G. H. Keyes, in charge, 51 Marion St., Charlestown, 150 m.g. storage capacity bulk oil plant at Head of Pines and Saugus River. $3,000,000. Private plans.

N. Y., New York—R. Cohn, 139 Bway., plans by J. Fisher, 45 Astor Pl., altering lodging house into warehouse, 169 Bowery. $40,000.

N. Y., New York—Santini Holding Co., 1337 Jerome Ave., plans by R. Gottlieb, 4756 3rd Ave., 8 story, 50 x 120 ft., storage plant, Jerome Ave. and Clark Pl. To exceed $125,000.

See proposal advertising on page 74

Constr. News page 101



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